REPORT RESUMES

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A SUMMER INSTITUTE FOR THE IMPROVEMENT OF TECHNICAL TEACHER EDUCATION PROGRAMS. FINAL REPORT.

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PURDUE UNIV., LAFAYETTE, IND., SCH. OF TECHNOLOGY

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THIRTY-SIX PARTICIPANTS SELECTED FROM COMMUNITY COLLEGES, TECHNICAL INSTITUTES, AND UNIVERSITY TEACHER EDUCATION STAFFS ACROSS THE UNITED STATES PARTICIPATED IN AN INSTITUTE TO STIMULATE AND ENCOURAGE THE DEVELOPMENT OF QUALITY BACCALAUREATE PROGRAMS IN TECHNICAL TEACHER EDUCATION. ACTIVITIES AND TOPICS OF THE INSTITUTE CONCERNED EXISTING TECHNICAL TEACHER EDUCATION PROGRAMS, DESIRED CAPABILITIES AND BACKGROUND OF TECHNICAL TEACHERS, AND RELEVANT RESEARCH FOR TECHNICAL TEACHER EDUCATION PROGRAM DESIGN. THE COMBINED INTERACTION AND PERCEPTIONS OF THE PARTICIPANTS, SPEAKERS, AND INSTITUTE STAFF RESULTED IN A SET OF GUIDELINES FOR DEVELOPING BACCALAUREATE TECHNICAL TEACHER EDUCATION PROGRAMS. THE GUIDELINES WERE AIMED AT ESTABLISHING A MINIMAL TEACHER BACKGROUND, RELATING THE TEACHER'S OCCUPATIONAL ORIENTATION TO THE JOB FUNCTION OF THE TECHNICAL STUDENT, AND FOCUSING ATTENTION ON THE BALANCE OF THEORETICAL AND OPERATIONAL CONTENT. THE CATEGORIES USED IN ORGANIZING THE INSTITUTE PROGRAM AND THE 24 GUIDELINES WERE TECHNICAL CONTENT, MATHEMATICS, SCIENCE, OCCUPATIONAL EXPERIENCE, GENERAL EDUCATION, AND PROFESSIONAL PREPARATION. ABSTRACTS OF SPEAKER AND CONSULTANT PRESENTATIONS ARE INCLUDED. RESULTS OF PRE-POST TESTING OF PARTICIPANTS SUGGESTED A RELATIVELY HIGH DEGREE OF SATISFACTION WITH THE TOTAL PROGRAM. (EM)

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A SUMMER INSTITUTE FOR THE IMPROVEMENT OF TECHNICAL TEACHER EDUCATION PROGRAMS

Joseph P. Arnold
Richard C. Erickson
Alan R. Suess

Purdue University

School of Technology

Final Report of Project 7-0528
U.S. Office of Education
Department of Health, Education, and Welfare

November 1967

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FINAL REPORT

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Joseph P. Arnold
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Purdue University
Lafayette, Indiana
November 1967

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U. S. Department of
Health, Education, and Welfare

Office of Education
Bureau of Research

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The completion of this report represents a culmination of effort by the participants, consultants, speakers, and project staff. The thirty-six participants became a dedicated group early in the institute, exhibiting an attitude of cohesiveness and diligence which prevailed through the final day of the program. Participants' names are listed on pages viii and ix of this report.

Special tribute is extended to Vice President C. H. Lawshe, Dean G. W. McNelly, Dr. E. M. Eddy, and the many Purdue staff members who took time from their busy schedules to prepare and present key parts of the program. Without the expertise of these persons, and many capable consultants and speakers from outside the university, the institute could not have succeeded. Speakers and consultants are listed on pages vi and vii.

The responsibility and efficiency of Mrs. Donna LeBold, whose skill in coordinating and completing many tasks associated with the conduct of the program and preparation of the report, cannot be overlooked. Without her services the completion of a quality report would have been extremely difficult.

Joseph P. Arnold
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SUMMARY

The institute was conducted with thirty-six participants selected mainly from community college, technical institute, and university teacher education staffs across the United States. The purpose was to stimulate and encourage the development of quality baccalaureate programs in technical teacher education. Activities and topics of the institute included (1) Existing Technical Teacher Education Programs, (2) Desired Capabilities and Background of Technical Teachers, and (3) Relevant Research for Technical Teacher Education Program Design. The combined interaction and perceptions of the participants, speakers, and institute staff resulted in a set of guidelines for development of baccalaureate technical teacher education programs.

Guidelines

General guidelines, which were assumed to permeate a total baccalaureate program for technical teachers, were developed. They were aimed at (1) establishing a minimal teacher background as similar to that of the prospective technical teacher's future students (at graduation), (2) relating the teacher's occupational orientation to future job function of the technical student, and (3) focusing attention on a balance of theoretical and operational content.

Six categories (technical content, mathematics, science, occupational experience, general education, and professional preparation) were utilized as a framework in the institute program and in developing guidelines which emphasize:

(1) acquisition of technical knowledge of greater depth and breadth than in courses likely to be taught;

(2) mathematical and scientific knowledge appropriate to the technology, level, and emphasis in which it is to be taught;

(3) appropriate occupational experience based on the needs of the technology, in some cases allowing the major portion to follow graduation from the teacher education program;

(4) the ability of the technical teacher to communicate with students, his peers, educational administrators, and the public;

(5) electives and course selections from the social sciences as basic to becoming responsible, participating members of society;

(6) an integrated sequence of professional content which focuses attention on the adult as a learner and includes an appropriate student teaching or internship experience.

Conclusions

The guidelines were developed in full recognition that a variety of constraints, attitudes, and characteristics heavily influence the nature of any program in a given institution of higher education. Hence, the temptation to prescribe courses, teaching methods, time requirements, and other relatively specific inclusions was resisted.

The need for an appropriate occupational orientation and a well integrated, balanced plan of coursework (and other activities) is apparent in the guidelines. It is hoped that universities and colleges with no experience in technical program design will give adequate attention to these two factors when planning and implementing technical teacher education programs.

INTRODUCTION

The Setting

Community colleges, technical institutes, universities, and other institutions offering technical and semi-professional programs are facing crucial problems in procuring professionally qualified teaching staff. It has become obvious to the administrators afflicted with the task of locating and hiring technical teachers that collegiate technical teacher education programs are presently of little significance as a source. While NDEA and other technical and semi-professional occupational programs have been implemented in increasing numbers, there has been a grossly inadequate parallel development in technical teacher education. A few universities and colleges, however, have moved in the direction of designing teacher education programs in technology teaching.

Baccalaureate programs in technical teaching are in operation at Oklahoma State University (Stillwater), University of Illinois (Urbana), Purdue University (Lafayette), and a few other institutions. The most productive of these is the Oklahoma program, which has produced 105 graduates (B.S.) since its implementation in 1960 and has several students in masters' and doctoral programs.[1]

The principal current sources of technical instructors apparently consist of competing technical institutions, industry, the military, members of non-teaching professions, and retired persons obtained from a variety of sources. Most new college graduates who enter technical teaching base their qualifications on education and experience in engineering or another discipline closely related to the position accepted. These graduates as well as those recruited from other sources are seldom the products of organized technical teacher education programs. It must be acknowledged that many competent instructional staff have taken the above routes into technical teaching. However, it is also claimed that these routes of entry often, if not usually, fail to provide or emphasize some desired combination of professional and academic background, related occupational experience, technical competence, and personal characteristics.

Purposes of the Institute

This institute was proposed and concucted to expedite the establishment of quality, comprehensive technical teacher education programs. It was proposed that institute participants, presentations, and project staff would focus efforts on developing a set of guidelines or policy statements which would give direction to teacher educators and others involved in the initiation and implementation of baccalaureate technical teacher education programs.

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[1] Presentation by Maurice Roney; abstract on page 53 of this report.

Activities to be planned in the institute program were:

1. Analyze a sample of existing technical education programs, pointing out implications for technical instructors.
2. Outline and review the capabilities and background needs of technical teachers.
3. Examine existing technical teacher education programs.
4. Cooperatively develop and critique sample technical teacher education programs among the group of participants.
5. Examine current and recent relevant research for possible use in technical teacher education program design.

PLANNING THE INSTITUTE

Selecting Participants

A preliminary announcement explaining the intent and activities of the institute was prepared (See Appendix D) and sent to all state directors of vocational education, directors of state research coordinating units, department heads of all listed Vocational-Technical teacher education departments of universities and colleges, and directors of the Ohio State University and North Carolina State University centers for research in Vocational-Technical Education. A variety of name lists containing junior college, technical institute, and other potentially interested professional personnel were also sent announcements. Accompanying the mailed announcements were application forms (Appendix E) designed by project staff for use in this institute. Telephone calls to the leadership of interested professional organizations and institutions were made in an attempt to procure well qualified applicants from technical institutes, community colleges, and other institutions employing technical teachers. Hence, the selection of participants was broadened beyond the original intent to use only teacher educators in favor of including users or employers of technical teachers. The criteria for selection among the applicants were: (a) experience, education, and other professional qualifications, (b) potential for involvement in technical teacher program development, (c) geographic representation, (d) age, and (e) recommendations of state directors of vocational education and other qualified references listed by the applicant. A balance of potential producers (teacher educators) and users (community college, technical institute staff, etc.) of technical teaching was ultimately decided upon by project staff as an additional guide for selection of participants.

Forty participants were selected from among the applicants, thirty-six of whom participated in the institute. The educational level, current job responsibility and technical area of interest of the participants may be examined by the reader in Table I.

Table I

Characteristics of Participants

	4-yr. Coll.	Jr. Com. Coll.	Tech. Inst.	Priv. Schl.	St. Dept. of Educ.	Pub. Schl.	Total
Educational Level							
Doctorate	7	1	0	0	0	0	8
M.S. +	8	2	2	0	2	1	15
M.S.	10	1	1	0	0	0	12
B.S. +	1	0	0	0	0	0	1
Total	26	4	3	0	2	1	36
Job Responsibilities							
Administrators	8	4	3	0	2	1	18
Teachers	18	0	0	0	0	0	18
Total	26	4	3	0	2	1	36
Technical Area of Emphasis							
Agriculture-related	2	0	0	0	1	0	3
Engineering-related	7	2	2	0	0	0	11
Health-related	0	0	0	0	0	0	0
Industrial	17	2	1	0	1	1	22
Office-related	0	0	0	0	0	0	0
Total	26	4	3	0	2	1	36

Agenda

A SUMMER INSTITUTE FOR THE IMPROVEMENT OF TECHNICAL TEACHER EDUCATION PROGRAMS

All sessions are scheduled in Room 314, Memorial Center, except as otherwise specified.

Sunday, July 9

Registration (East Foyer, Memorial Center)		3:00-7:00 p.m.

Monday, July 10

Coffee and Introduction	Institute staff	8:30-9:30 a.m.
Institute Overview	J. P. Arnold	9:30-10:00
Evaluation Procedures	R. C. Erickson	10:00-11:30
Orientation to Purdue	G. W. McNelly	11:30-12:00
The Role of the Technical Teacher	L. A. Emerson	1:45-3:00 p.m.
Technical Manpower Needs	J. P. Lisack	3:30-4:30
Program Evaluation	Project staff	4:30

Tuesday, July 11

Use of Curriculum Guides in Technical Teacher Education	W. J. Brooking	8:30-9:30 a.m.
Review of Existing Technical Teaching Programs	J. S. Dobrovolny M. W. Roney J. P. Arnold P. W. Ruehl	10:00-11:30
Luncheon (Lafayette Room, Purdue Memorial Union)		12:00-1:30 p.m.
Development of Purdue's School of Technology	C. H. Lawshe	
Review of Existing Technical Teaching Programs--continued		1:30-2:30
Reactions to Existing Technical Teaching Programs	Institute Participants	3:00-4:00

Agenda (Continued)

Tuesday, July 11 (continued)

Current and Anticipated Demand for Technical Teachers	A. R. Suess	4:00-4:30
Program Evaluation		4:30

Wednesday, July 12

Overview of Program Content	Staff	8:30-9:00 a.m.
Science & Mathematics Background for the Technical Teacher	G. L. Rainey J. R. Maris H. R. Johnson	
Science & Mathematics--continued		10:30-12:00
Organization into Work Groups		1:30-2:00 p.m.
Group Work	Institute Participants	2:00-2:45
Group Work--continued		3:15-4:30
Evaluation		4:30

Thursday, July 13 (Room 302)

Panel of Participants Discusses Science & Mathematics	Institute Participants	8:30-10:00 a.m.
Technical & Occupational Background of the Technical Teacher	W. E. Thomas G. A. Sherman M. A. Ratner	10:30-12:00
Group Work--Technical & Occupational Background	Institute Participants	1:30-2:45 p.m.
Group Work--continued		3:15-4:30
Program Evaluation		4:30

Friday, July 14 (Room 302)

Panel of Participants Discusses Technical & Occupational Background	Institute Participants	8:30-10:00 a.m.

Agenda (Continued)

Friday, July 14 (Continued)

General Education for the Technical Teacher	J. P. Arnold E. J. Simon	10:30-12:00
Group Work, General Education	Institute Participants	1:30-2:45 p.m.
Group Work--continued		3:15-4:30
Program Evaluation		4:30

Monday, July 17

Panel of Participants Discusses General Education	Institute Participants	8:30-10:00 a.m.
Professional Preparation for the Technical Teacher	R. C. Erickson R. A. Hill C. R. Hill	10:30-12:00
Group Work, Professional Preparation	Institute Participants	1:30-2:45 p.m.
Group Work--continued		3:15-4:30
Program Evaluation		4:30
Optional Program Auto-tutorial approach to Teaching (Room G-15, Life Sciences Bldg.)	S. M. Postlethwait	7:00-8:30

Tuesday, July 18

Panel of Participants Discusses Professional Preparation	Institute Participants	8:30-10:00 a.m.
Research with Implications for Technical Teacher Education	J. Moss W. K. LeBold	10:30-12:00
Group Work, Research	Institute Participants	1:30-2:45 p.m.
Group Work--continued		3:15-4:30
Program Evaluation		4:30

Agenda (Continued)

Tuesday, July 18 (Continued)		
Optional Program Demonstrations, Machine Tool Laboratory (Michael Golden Building)	O. D. Lascoe	7:00-8:30
Wednesday, July 19		
Panel of Participants, Research with Implications for Technical Teacher Education	Institute Participants	8:30-10 a.m.
Special Problems	C. R. Bowen J. J. Defore	10:30-12:00
Group Work Special Problems	Institute Participants	1:30-2:45 p.m.
Panel of Participants Discusses Special Problems	Institute Participants	3:15-4:30
Program Evaluation		4:30
Thursday, July 20		
Orientation, Development of Sample Programs	Institute Staff	8:30-9:30 a.m.
Group Work, Development of Sample Programs	(Available speakers assigned to groups)	10:00-12:00
Group Work--continued		1:30-2:45
Panel of Participants Examines Problem Areas in Sample Programs	Institute Participants	3:15-4:30
Program Evaluation		4:30
Dinner & Presentation of Certificates	Dean G. W. McNelly	6:00
Group Leaders & Staff Plan Presentation of Sample Programs		7:30-8:30
Friday, July 21		
Participants Present Sample Programs	Institute Participants	8:30-10:00 a.m.
Institute Evaluation		10:30-12:00
Dismissal		12:00

GUIDELINES FOR THE DEVELOPMENT OF BACCALAUREATE TECHNICAL TEACHER EDUCATION

The guidelines were written for duplication, distribution and use beyond inclusion in this report; hence, portions of the introductory material may appear to be repetitious in relation to other sections of the final report.

Introduction

The well acknowledged shortage of technical teachers finally has resulted in a focus upon the near absence of formal programs for preparation of such teachers. While baccalaureate programs of instruction have become the standard source of teachers for public elementary and secondary schools, no parallel for the preparation of post-high school technical teachers has developed. Staffing the new and expanding technical programs has caused a massive search for qualified teachers, nearly all of whom are expected to have the bachelor's degree as a minimum standard of preparation. As the search for technical teaching staff accelerates, relatively few colleges and universities have baccalaureate programs designed to prepare technical teachers. The purpose of the guidelines stated in this document is to provide direction for those involved in the initiation or revision of baccalaureate technical teacher education programs.

The guidelines represent a culmination of organized effort by institute staff based upon group work of participants and presentations by speakers during the Institute for the Improvement of Technical Teacher Education Programs conducted at Purdue University, Summer 1967.

The transitional nature of the guidelines should be recognized. It is expected that revisions will become appropriate at such time as future experience and research in technical teacher education dictate.

Policy statements describing desirable characteristics, limitations, and content of baccalaureate technical teacher education programs were developed in small group discussions among the institute participants. The experience and orientation of the individual participants were supplemented with prepared presentations by consultants with relevant experience in education. Institute participants also had available a variety of institutional catalogs, curriculum materials, and research reports. The resulting synthesis of prior and immediate experience and supplemental information became the basis for the participants' development of the policy statements. Daily panels, comprised of one representative of each small group, reported, reviewed, and refined the policy statements developed by the groups of participants. These refined statements were in turn utilized by institute staff as the primary source in developing the guidelines.

Three assumptions were made prior to the development of these guidelines. First, it was felt that the technical teacher under discussion in this report is to be prepared for post-high school and/or college level technical teaching. Second, the teacher is to be prepared primarily for teaching subjects within his technical specialty. A program based on these guidelines would not be intended to produce a good mathematics, physics, or chemistry teacher for a technical program. Third, the guidelines are written in full recognititon that graduate degrees are ultimately expected or at least desired by potential employers.

Guidelines

The guidelines were developed within six categories, which are: (1) General Education, (2) Mathematics, (3) Science, (4) Technical Content, (5) Occupational Experience, and (6) Professional Education.

General Guidelines

It became evident that a few of the guidelines were applicable to several of the six categories or topics in the program agenda. These guidelines were recognized as having general import to baccalaureate program development in technical teacher education.

1. The level of instruction for the technical teacher (particularly in science, mathematics, and the technical areas) should be at least commensurate with that expected of the graduates of the technical program in which the prospective teacher is most likely to be placed.

In certain technologies it is necessary for the teacher to have depth well beyond that expected of his students on graduation. For example, completing an associate or other degree in the technology to be taught would likely provide a sound basis for counseling students and working with other technical teachers. Similarly, a strong technical background may aid in interpreting future technical developments.

This guideline is not intended to mean that the bachelor's degree technology teacher must have completed an associate degree technical program as a part of or in addition to his baccalaureate work. A baccalaureate program designed for associate degree graduates is one feasible approach. However, an associate degree prerequisite can place severe restrictions on being technically current upon entry into teaching.

2. Coursework and other instructional activities for the technical teacher should, whenever possible, reflect an understanding and awareness of the functional role of the graduates of the program in which the technical teacher is most likely to serve.

Successful employment in a technical occupation is the primary objective for the technical program graduate. The technical program enrollee should develop an understanding of the functions and responsibilities expected of the technician. The responsibility for this understanding rests with the technical teacher, who must therefore strive to relate curricular experience to the future job function of technical students.

3. Balance between theoretical and applied content for the technical teacher should be carefully established and maintained to provide a meaningful frame of reference while retaining the theoretical basis necessary for adjustment to technological advances.

One generally distinguishing characteristic of technical occupations is the need for knowledge of and facility with sophisticated testing and laboratory equipment and/or precision measuring devices of various kinds. Procedures for the effective use of such equipment usually demand judgment and rational thinking beyond that normally required of the skilled craftsman. Teaching the theoretical bases of a given technology will help both the technician and the technical teacher adjust to changes as they occur. Theoretical emphasis, however, must not be stressed to the exclusion of skills using hardware and/or test equipment which tend to differentiate many of the technical occupations from the professional.

General Education Guidelines

1. Courses and activities which enable the technical teacher to communicate ideas mathematically, linguistically, and graphically should be included in the program.

Technical teachers must be able to communicate effectively with students, potential employers, parents, and other teachers as a requisite for success in the teaching environment. Instruction in speech, technical report writing, print reading, computer programming, business letter writing, and other communication skills important to the technology should be included in the program. These written, oral, and computer language skills should occupy a position of prominence as should graphical and mathematical communication tools peculiar to the technology.

2. Non-technical elective courses and related activities should be required as part of the program to enrich the technical teacher's academic background.

A technical teacher education student should be required to complete a portion of the degree requirements in courses outside the technical areas and outside areas of study considered as preparation for teaching. Development and maintenance of interests beyond the teaching objective would thus be encouraged. The intent is to broaden the otherwise relatively narrow experience of the prospective teacher, improving the level of understanding as a requisite for effective interaction with people of varying interests and backgrounds.

The technical teacher probably has a more critical need for general education than do most other teachers, because of the nearly impossible task of constantly up-dating technical background throughout a teaching career. Because of the pressures of remaining current in the technology, the only real opportunity for a prospective technical teacher to obtain background in areas such as the humanities and the social and behavioral sciences may be in the baccalaureate program.

The master's degree is considered as an accepted minimum standard of preparation for the technical teacher as well as for most other teachers. Background beyond the technical and scientific areas will anticipate enrollment in graduate programs following completion of the baccalaureate. Substantial involvement in the general studies areas will help the prospective teacher gain admission to an adequate graduate school and provide capabilities necessary for competition with graduate students of other disciplines.

3. Instruction in the social sciences should be provided to broaden the technical teacher's awareness, understanding, and intelligent participation in the activities of a complex society.

Educators are perennially struggling with selection of content designed to include and transmit those aspects of the culture which will enable each student to become a responsible, participating member of society. The technical teacher must share with other citizens the elements of background based on the social, economic, and governmental structures as necessary for understanding and supporting the goals of the democratic community. Hence, the prospective technical teacher lacking a measure of knowledge and maturity in the social sciences would be unnecessarily handicapped in assuming the responsibilities of citizenship and the demands of the teaching profession.

The preceding plea to include education for social and civic responsibility is in response to pressures on the technical teacher exerted mainly from outside the teaching environment. It must be stated that a parallel, overlapping set of responsibilities exists from within the teaching community. The technical teacher should be able to define the relationship of his work to the goals of society and defend his professional interests on the basis of knowledge and maturity in the social sciences.

Mathematics Guidelines

1. Mathematical knowledge and facility for the technical teacher should be at least equivalent to that expected of graduates of the type of technical program for which the teacher is being prepared.

Teaching effectiveness is enhanced by the comprehensiveness of instructor knowledge of a given technological field. That knowledge is, at least in many major technological areas, dependent on mathematical background and explanations for effective communication. However, since this is obviously not true for certain of the technologies, it appears that the best overall recommendation for mathematics content is to require as a minimum in all technical teacher education programs that level of facility provided the prospective teacher's students.

2. Additional mathematical competency (beyond that outlined in the preceding guidline) should be required of the technical teacher in programs where the technology demands additional competency in order to understand and communicate the technical content.

Mathematical explanations are basic to the engineering and certain other technologies. The teacher in these technical programs must therefore be equipped with mathematical background and facility in addition to that expected of technical students as a requisite for graduation. The amount and type of additional mathematics required should be dictated by the demands of the particular technology.

The teacher in some technologies needs mathematics of a higher level, or in other cases a variety of approaches and concepts at the same level as required of technical program graduates. Overall, it must be recognized that differences across the many technologies in a teacher's explanatory usage of mathematics are extensive.

Differences within a given technology also are obvious but should cause relatively few problems in a teacher education program. When identically titled technical curricula in different institutions have dissimilar mathematical requirements, the preparation of the prospective technical teacher should be geared to the more complex program. Actual selection of mathematical content for the technical teacher then must relate not only to its explanatory value in teaching, but also to variation within technical programs of the same type as well. Mathematical content in technial teacher education programs should be based on the mathematics courses in the technical programs in which the prospective teacher is likely to find employment.

3. Mathematics courses for the technical teacher should emphasize applications appropriate to the orientation and job function of the technician.

Problem solving has been mentioned previously as basic to the role of the technician. Education both for the technician and for the teacher of the technician should therefore attempt to maximize the transfer and applicability of the content for use by the technician in performing his job. Mathematics courses emphasizing approaches to the solution of technological problems should take precedence over courses which stress derivatives and mathematical theory for explanation and examples. (See General Guideline Number 2, Page 16)

Science Guidelines

1. Scientific knowledge required of the technical teacher should be at least equivalent to that expected of graduates of the type and level of technical program for which the teacher is being prepared.

Teaching effectiveness is at least partially contingent upon comprehensive knowledge of a given field. Although teaching skills play a definite role in teaching effectiveness, knowledge of the scientific principles underlying the primary technical content is mandatory. Comprehensive knowledge of scientific principles equal to the knowledge required for entry level technicians must be considered as the minimum permissible level of proficiency for technical teacher education graduates.

2. Additional scientific background (beyond that outlined in the preceding guideline) may be required for study in those technologies where additional depth and/or breadth is necessary to understand and communicate the scientific bases of the technical content.

Although a level of scientific understanding may be required to function effectively as a technician, additional knowledge often is required to explain alternatives or handle remedial instruction to create effective teaching-learning situations. Depth and breadth in the sciences beyond the level expected of graduating technical students should make technical content and underlying principles more meaningful to the teacher and therefore easier to transmit to students in technical programs.

3. Science courses should provide the technical teacher with the laboratory emphasis appropriate to the job function of the technician.

Science courses, regardless of level, should be taught with laboratory oriented problem solving approaches. Laboratory activity should stress the organization and quantification of data relevant to the phenomenon under study and utilize appropriate procedures for problem solution. (See General Guideline Number 2, Page 16)

Technical Content Guidelines

1. Depth and breadth in technical courses for the prospective teacher should extend beyond that required of the graduates of the program in which employment as a teacher is anticipated.

The technical teacher needs a thorough knowledge of the technical speciality. This competence is requisite to (1) qualifying as an authority to students, (2) working with a broad range of student abilities, (3) reducing time in lesson preparation, (4) adapting to changes in the technology, (5)accommodating teaching assignment revisions, and (6) establishing self-confidence as a teacher.

2. Technical content for the prospective teacher should be integrated with science, mathematics, communications, and professional courses.

Technologies are generally recognized as being rooted in scientific and mathematical knowledge and principles. Therefore, technical content for both the technical teacher and for his students should be coordinated and integrated with scientific and mathematical principles and theories. Relating technical content as closely as practicable to its theoretical bases, while emphasizing the laboratory skills and equipment orientation which are fundamental to most technical occupations, appears imperative. Post-high school technical programs generally are focused on accomplishing this end, but such coordination could easily be overlooked when designing a baccalaureate technical teacher education program in an institution without previous staff and program experience in technical education.

3. Technical content for the prospective teacher should be distributed and scheduled throughout the entire span of the baccalaureate program.

Dispersing technical courses throughout the entire program is considered a necessity. This procedure maximizes readiness for student teaching or internship near the end of the program. In addition, the prospective teacher will upon graduation have recently completed advanced technical courses and as a consequence will tend to begin teaching with more current technical knowledge.

4. Technical content for the prospective teacher should employ a laboratory emphasis which strongly relates to the occupational objective of students in the type of program for which the prospective teacher is preparing.

The various technical occupations with which technical teachers are concerned involve testing, analyzing, computing, measuring, inspecting, and other functions requiring use of specialized instruments and procedures. Both the technical teacher and the new technician should be skilled in the use of the basic instruments with which they will be expected to work.

Occupational Experience Guidelines

1. Technical level occupational experience should provide the teacher with knowledge of current industrial or business practice at a level minimally commensurate with that associated with the employment expectations of graduates of technical programs of the type and level for which the prospective teacher is being prepared.

Technical employment can contribute to the teaching effectiveness of the teacher by supplementing the technical knowledge and experience gained in the classroom and laboratory. The technical teacher with appropriate work experience can rely on both formal instruction and work experience as a basis for teaching. Any meaningful work experience probably adds to the teacher's maturity and judgment. However, experience in or closely related to the employment of technical program graduates will maximize his teaching effectiveness. Employment on jobs which demand little or no relevant technical knowledge are not acceptable. Conversely, appropriate field experience at professional levels which call for technical functions above the technician level would usually merit consideration.

2. Occupational experience requirements for the prospective teacher should emphasize pre-arranged, supervised, cooperative programs rather than evaluation of previously obtained employment experience.

The supervised, cooperative type of work experience program affords opportunity for placement in a job situation which provides the appropriate level of activity, opportunity to work in several areas of importance to the technology, and exposure to current industrial practices. Hence, this type of work experience can minimize repetitive and non-applicable efforts which are often significant components of previously obtained work experience.

Previously obtained occupational experience, when considered as part of a program of study, should be carefully documented and scrutinized for its relevance and possible usage for credit. If credit is granted for previous experience, consistent policies for its evaluation should be established and should stress relevance of the experience rather than job tenure.

3. The amount and emphasis of occupational experience required of the technical teacher should relate to the requirement of the technology.

A blanket work experience requirement established without consideration of the technological area or the courses to be taught is increasingly difficult to defend. A teacher in one technology may find an appropriate technical level work experience to be a major contributor to teaching effectiveness. The teacher in another technology may find technical background acquired through formal class and laboratory activities to be the primary criterion for teaching success. The requirements of the technology itself, the level of the program, and the courses likely to be taught are all factors which determine the true relationship of occupational experience to teaching performance.

4. The major portion of the occupational experience of the teacher can often follow graduation from the baccalaureate program.

Including a complete occupational background as a requirement for the baccalaureate degree is comparable to requiring the medical internship for the Doctor of Medicine degree. Although the doctor is not licensed until the internship is satisfactorily completed, the "occupational" requirement is completed after graduation. While some occupational experience upon entry into teaching is perhaps desirable in many technologies and necessary in others, it is suggested that building an appropriate occupational background after graduation may be justifiable.

Pre-service occupational experience of necessity increases time required to complete a baccalaureate program. Hence, differentiated occupational requirements that allow later completion of a major portion of the occupational experience will improve the position of technical teacher education programs in attracting students.

Summers, sabbatical leaves, and other periods of time subsequent to graduation could be utilized to extend or build a background of occupational experience which would be more current. This plan also has the added advantage of focusing attention on activities which relate more directly to improving teaching through coordinating occupational experience with teaching responsibilities. In addition, a major part of the responsibility for obtaining and coordinating occupational experience would thus transfer from the college or university to the teacher and to the employing institution.

Professional Education Guidelines

1. Professional courses for the technical teacher should focus on the adult as a learner.

A basic assumption influencing all of the proposed guidelines is that the prospective teacher will teach in a post-high school and/or college level position. Technical teacher education programs preparing teachers for secondary school programs are thus arbitrarily excluded. Adult learners entering the teaching-learning situation with unique value perceptions, different motivational patterns, and an advanced level of maturity demand a unique approach to teaching. Common problems, issues, and methods in teaching are acknowledged for all levels of teaching. However, factors such as motivation, pace of instruction, and potential examples and illustrations are quite different for elementary school children than for the more mature technical students. Consequently, the professional aspects of the program should be based on consideration of the adult as a learner.

2. An integrated sequence of professional courses should be designed to provide the prospective teacher with an understanding of the methods and problems associated with technical teaching.

Professional courses early in the baccalaureate program should introduce the prospective teacher to the nature and problems of technical teaching. Sequencing and integrating pedagogical content are strategic factors in leading the student from an orientation to the nature and problems of technical teaching through the educational psychology, course construction, or other professional courses or units which precede and culminate in a supervised teaching experience. The integrated sequence of pedagogical content should emphasize application of scientific and technical knowledge in practical classroom and laboratory situations.

Many currently experimental practices should be considered to demonstrate, review and evaluate student teaching performance. Micro-teaching, video tape monitoring, and interaction analysis are examples of innovations for study and possible employment to improve the efficacy of professional activities.

Advanced technical courses can be structured to contribute to future effectiveness as a teacher. For example, demonstration of test equipment usage can draw attention to how to teach others to use the equipment.

3. The evolution and function of technical education should be taught in the technical teacher education program.

The technical teacher should understand the role and function of technical education in the educational spectrum. This understanding should assist in the development of a consistent and enlightened point of view toward the goals of the technical teaching objective. If the prospective teacher is equipped with a defensible purpose, then course construction activities, student-teacher relationships, inter- and intrafaculty associations are all likely to acquire a consistent direction.

4. A supervised teaching experience or teaching internship should be completed in the technology in which the student is being prepared to teach.

A variety of possible approaches to providing a suitable supervised teaching experience typically revolve around student teaching and internship. Student teaching for credit under the supervision of a competent technical teacher is probably the most economically and administratively feasible approach for new programs. However, requiring completion of a carefully planned and operated teaching internship would provide a more appropriate exposure and experience in technical teaching. A third, perhaps supplemental but important consideration is the possible involvement of students as laboratory and teaching assistants.

Summary

The general guidelines were originated in recognition of characteristics and requirements which probably should permeate the total baccalaureate technical teacher education program. These guidelines (Pages 16-17) are aimed respectively at (1) establishing a minimum background similar to that of the prospective teacher's future technical program graduates, (2) relating the teacher's occupational orientation to future job function of the technical student, and (3) focusing attention on the inclusion of a balance of content at the theoretical and operational levels. The general guidelines are intended to provide curriculum planners with considerations which are applicable in the initial planning or revision of nearly any aspect of a baccalaureate technical teacher education program.

Application of all the guidelines in the development of baccalaureate technical teacher education programs across institutions would result in the establishment of programs which are considerably different one from another. The organizational structure of each institution, staff characteristics, political restraints, and a host of institutional policies and attitudes would heavily influence the nature and operation of any program. Although in writing the guidelines the temptation prevailed to suggest courses, number of semester hours credit, and a myriad of other relatively specific recommendations, such action was deferred to allow only those statements which would recognize the capability and prerogative of college staffs in gearing such technical teacher education program to the technologies and type of teaching employment for which each institution is best qualified to prepare its students.

Recommendations on the use of the guidelines in the categories of general education, technical content, occupational experience, mathematics, science, and professional teacher education, are intended as considerations above and beyond the general guidelines. The noticeable overlap among the guides in the areas of mathematics, science, technical content, and professional education is recognized. Integration and coordination of these particular areas is currently well focused in many existing technical programs. However, to provide orientation and integration across the various areas of technical teacher preparation in colleges and universities which have little or no experience in technical program design and operation may be unusually difficult.

EVALUATION

The evaluation scheme that was formulated and fulfilled for the institute included three types of assessments - (1) participant satisfaction with daily presentations, (2) participant satisfaction with the total program, and (3) participant attitude change relative to preferences for technical teacher background.

Satisfaction with Presentations

Each participant registered his degree of satisfaction with the daily presentations by completing the Likert type ten-point Rating Scale for Presentations during the evaluation period scheduled at the close of each daily session. A copy of this scale is presented in Appendix A.

The number of individuals making presentations varied from day to day throughout the program. Participants were therefore directed to rate each day's presentations as a whole with respect to the qualities listed on the rating scale. Data from the completed forms, then, represent general participant satisfaction relative to the entire group of presentations given on a particular day, rather than satisfaction relative to any particular speaker or presentation.

A summary of these data is presented in Table II. Mean ratings at the high end of the ten-point scale are indicative of extreme participant dissatisfaction with respect to the quality listed, while ratings at the low end of the scale are indicative of extreme satisfaction. In lieu of presenting a lengthy discussion of the mean ratings presented in Table II, it is suggested that the reader study the mean values for each criterion under the sets of daily presentations. The reader is referred to the Institute Agenda, pages 10-13, for more precise identification of daily topics.

However, two of the values presented in Table II (4.69 and 4.05) exceeded 4.00, or the positive one-third of the scale. The infrequent occurrence of mean ratings in the middle and upper regions of the scale would seem to indicate, in general, a rather high degree of overall satisfaction with the daily presentations.

Satisfaction with Total Program

Each participant registered his degree of satisfaction with the total program by completing the five-point Likert type Institute Evaluation Scale at the close of the program. One-half of the thirty evaluative statements included in the scale were couched in negative terms, and the remaining one-half were stated in a positive format. These statements and a summary of the participants' responses to them are presented in Table III. As was the case in presenting the data derived from the Rating Scale for Presentations, only the highlights of the institute evaluation data will be presented here. It is suggested that the reader study the frequency distribution and mean value of the participants' responses to each of the thirty statements.

TABLE II

MEAN VALUES FOR PARTICIPANTS' RATINGS OF THE DAILY PRESENTATIONS

Presentation Topics Criteria	Orientation	Existing Programs	Science & Mathematics	Technical	General Education	Professional	Research	Special Problems
1. Presenters' Interest in Subject	1.89	2.22	2.00	2.83	2.54	2.63	2.57	2.25
2. Liberal & Progressive Attitutde of Presenters	2.44	3.33	2.88	3.36	3.14	3.35	2.86	2.57
3. Manner of Subject Matter Presentation	2.50	3.19	2.47	3.28	3.11	3.67	3.06	2.54
4. Sense of Proportion & Humor of Presenters	3.11	3.11	3.25	2.97	2.88	3.62	3.43	2.57
5. Organization of Subject Matter for Presentation	2.22	2.63	2.44	3.14	3.20	3.23	2.60	2.40
6. Self-reliance and Confidence of Presenters	1.75	2.19	2.11	2.72	2.43	2.94	2.20	2.14
7. Personal Peculiarities of Presenters	2.31	2.53	2.55	2.94	2.34	3.29	2.77	2.66
8. Stimulating Intellectual Curiosity	2.72	2.61	2.83	3.83	2.74	3.32	3.60	3.17
9. Emphasis of Content in Presentation	2.75	2.80	3.06	3.94	2.43	3.85	3.23	2.71
10. Contribution to the Objectives of the Institute	2.64	2.50	4.69	3.64	2.46	3.44	4.05	2.89
Mean Rating	2.43	2.71	2.82	3.27	2.73	3.33	3.04	2.59

TABLE III

MEAN VALUES AND FREQUENCY DISTRIBUTION FOR PARTICIPANTS' EVALUATION OF THE INSTITUTE

	Frequency Distribution					
Statements	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)	Mean
In regard to this conference I feel that:						
1. The purposes of the institute were clear to me	20	15	0	0	0	4.57
2. The objectives of the institute were not realistic	1	1	0	15	18	1.63
3. Well defined purposes made it easy to work efficiently	13	22	0	0	0	4.37
4. The purposes of the institute were accepted by the participants	24	11	0	0	0	4.69
5. The objectives of the institute were not the same as my objectives	1	0	2	20	12	[illegible]
6. I didn't learn anything new which would help me in technical teacher education program development	0	1	0	8	26	1.31
7. The material presented was valuable to me	24	10	1	0	0	4.66
8. I could have learned as much about technical teacher education by reading	1	0	1	14	19	1.57
9. Possible solutions to my problems were considered	6	25	4	0	0	4.06
10. The information presented was too elementary	0	0	0	21	14	1.60
11. The speakers knew their subjects well.	14	17	2	2	0	4.23
12. The time spent in work groups was worthwhile in terms of the objectives of the institute	24	11	0	0	0	4.69
13. I was stimulated to think objectively about the topics presented	13	19	3	0	0	4.29

TABLE III (Cont.)

Statements	Frequency Distribution					
	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)	Mean
14. New acquaintances were made which will help in future technical curriculum development	19	14	2	0	0	4.49
15. We worked well together as a total group	26	9	0	0	0	4.74
16. We did not relate theory to practice .	0	1	3	21	10	1.86
17. The sessions followed a logical pattern.	13	22	0	0	0	4.37
18. The institute schedule was too rigid .	0	1	3	23	8	1.91
19. The work group discussions were excellent	13	21	1	0	0	4.34
20. There was very little time for informal conversation	0	1	0	21	13	1.69
21. Too much time was devoted to trivial matters	2	1	0	20	12	1.89
22. I felt a part of this group	24	11	0	0	0	4.69
23. The work group sessions were dominated by a few individuals	0	2	3	18	12	1.86
24. The institute met my expectations	18	16	1	0	0	4.49
25. I have no guide lines for future action.	0	0	0	16	19	1.46
26. I did not have an opportunity to express my ideas	1	0	0	10	24	1.40
27. The information presented was too advanced	0	0	0	12	23	1.34
28. The content presented was not applicable to program development in technical teacher education	0	0	0	12	23	1.34
29. Institutes such as this will contribute little to curriculum development in technical teacher education	0	0	0	11	24	1.31
30. Institutes of this nature should be offered in future years	28	6	1	0	0	4.77

The apparent tendency for the participants to agree with the positive evaluative statements and their tendency to disagree with the negative should be noted. The participants' reactions to these statements certainly suggest a relatively high degree of participant satisfaction with the total program.

Attitude Change

Each participant's change in attitude relative to the importance of various curricula and experiences that could rationally be included in a technical teacher education program was assessed through his reactions to the Technical Teacher Background Preference Attitude Scale presented in Appendix B. The twelve curriculum and experience categories included in this ten point scale were derived from inclusions in the Purdue Technology Teaching Program. These categories were assumed to be inclusive of all types of formal preparation which may be feasible to include in a technical teacher education program.

Kendall's coefficient of concordance (W)[1] procedures were used to assess pre and post test levels of agreement among the thirty-five participants* who ranked responses to the attitude scale. Whereas, Spearman Rho may be used to express the degree of agreement between the ranked ratings of two raters, W may be used to assess agreement among ranked responses of a number of raters.

Pre and post session coefficients expressing the degree of agreement among the institute participants relative to the twelve curriculum or experience categories listed on the background preference scale were $W=.45$ and $W=.51$, respectively.

In both instances W was found to be significant beyond the .001 level. Consequently, it was concluded with considerable assurance that participants as assessed in pre and post session testing, tended to agree on the relative importance of the listed curriculum and experience categories to technical teacher education beyond that which could be accounted for by chance.

One major objective of the institute was to move the participants toward some consensus of opinion relative to content in technical teacher education. The data suggest that very little was accomplished toward this end.

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[1] Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, McGraw-Hill Co. Inc., New York, 1956, pp. 229-39.

*The statistical significance of the pre and post session coefficients was determined by applying the formula: $X^2 = k\ (M - 1)W$

Variation between the pre and post session coefficients was not large enough to be attributed to anything other than chance variation with any reasonable degree of confidence. It should be noted, however, that the variations between pre and post session levels of agreement were in the direction of greater concensus of opinion.

While the pre and post session coefficients of concordance provided information concerning the shift in overall level of agreement among the participants, they provided no information relative to shifts in attitude toward specific curricula or experiences. The pre and post session relative rankings, means, and variances presented in Table IV provide some information as to the relative importance and level of participant agreement for each of the twelve categories.

The relative ranks of the twelve categories appear to differ considerably. Shifts are recorded for seven of the twelve curriculum or experience areas. However, it should be noted that the small variation for the distribution of means on which the ranks are based tends to minimize the value of Table IV in establishing the relative importance of the items listed.

The tabled variances provide some information relative to pre and post session levels of agreement among the institute participants for each of the twelve categories. A decrease in variation from pre to post session reactions to a particular category would seem to indicate some movement toward consensus of opinion relative to that curriculum or experience area. A greater degree of agreement among the participants at the close of the institute [illegible] of the twelve categories. It should be noted, however, that the small variation in the pre and post session distributions of the participants' responses to each category certainly minimizes the value of Table IV in establishing the extent to which the homogeniety of the participants' attitudes toward the listed curricula or experiences may have been affected during the weeks of the institute.

TABLE IV

PRE AND POST SESSION RELATIVE RANKINGS, MEANS, AND VARIANCE FOR PARTICIPANTS' REACTIONS TO THE TECHNICAL TEACHER BACKGROUND PREFERENCE SCALE

Curricula or Experience	Pretest			Postest		
	Rank	Mean	Variance	Rank	Mean	Variance
1. Allied Technical	7	8.00	.88	7	7.83	2.38
2. Behavioral Science	9	6.54	1.85	9	6.94	1.76**
3. Business Administration	12	5.60	4.07	12	5.20	2.93**
4. Humanities*	11	5.71	3.15	10	5.97	2.62**
5. Life Sciences*	10	5.80	1.46	11	5.71	3.21
6. Mathematics*	6	8.20	1.58	4	8.49	1.37**
7. Physical Sciences*	8	7.89	2.52	6	8.17	1.91**
8. Professional Teacher Education	3	8.71	2.45	8	7.51	2.10**
9. Related Occupational Experience	2	8.86	1.77	3	8.45	.90**
10. Student Teaching*	4	8.54	3.34	2	9.00	1.59**
11. Technical Specialty	1	9.37	.82	1	9.60	.48**
12. Written and Oral Communication	5	8.51	1.43	5	8.31	1.52

*Indicates a shift in rank between pre and post session administrations.
**Indicates a greater degree of agreement at post session administration than at pre session administration.

ABSTRACTS OF PRESENTATIONS

Several of the abstracts in this report were developed by project staff from tape recordings, and as such are subject to transcription errors.

Student Enrollments in Technical Programs

George W. McNelly*

We have common problems and certainly we have diversified opinions, and I hope these come out in this conference. I want to allude to two of these problems which stand out above the rest. First, I want to talk about the shortage of students in the technical field. If we are short of students, we certainly are short of those students who will be the potential teachers in the technical field. I think we can assume that many of those who are students in the technical fields will eventually become teachers. In other words, this is your raw material for teachers. It would be nice if we had all the technical teachers needed and increasing numbers of students at our doors.

We're seeing sweeping increases in enrollment all over the nation. We have upwards and over, I believe, five million students in one kind of higher education program or another. In the face of the sweeping increases of university enrollment, the actual graduations in both engineering and other technologies are rather flat. Last year we graduated about 36,000 engineers at the bachelor's level. Actually the enrollments in engineering during five of the last seven years have been down, having crept up a little in the last two years. The need for engineers certainly has increased. We have increased defense needs, space needs, a galloping economy, and research and development expenditures of the nation have increased to something like $21 billion a year.

I don't think that the enrollments and graduations in engineering will increase in the foreseeable future. It seems like the students who are coming to our doors are more and more interested in the liberal arts areas. Maybe one of the major reasons for this is that no matter what your bachelor's degree is in, there seems to be an available job at a good starting salary. It's either that we don't make the technical job a high enough paying one or we are just going to have to face the phenomenon that not enough people will be going into technical fields. Hence, those technical people that we do have will be in such an increasingly short supply that they will have to be more efficient in order to do the job. Enrollments at all technician levels have not been rising rapidly. In fact last year we graduated something like 13,000 plus in the so-called engineering technologies and ten years ago we had something like 16,000.

What can we do to increase student enrollment and interest in the whole field of technical education, engineering, and the technologies? I feel because of the present science oriented trend in modern engineering education that we can't hope to have increased enrollments here.

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*Dr. McNelly is Dean of the School of Technology, Purdue University.

The great hope lies in the field of technology. There is a greater probability of success for a greater percent of the population of youngsters interested in higher education in the field of technology than in engineering. The major reason for the growth is that we've removed any barrier to the student going on from the associate degree to the bachelor's degree. We were one of the large universities to see and remove this barrier at an early date.

Those of you that are interested in stimulating your enrollments must remove the stigma of non-college level that seems to have been associated with the two-year program. If you're in a junior college, you have to enter into close cooperation with the nearest university to develop additional educational opportunity for your graduates.

One of the problems of two-year programs, or for that matter any university programs, is the problem of squandering your limited resources. It's good to have diversity, and we do in this nation in terms of education. But there is a great tendency in the technical field to fragment. We look at every little opportunity or need as a giant vacuum to be filled. When in reality many of these vacuums are not vacuums at all but abysses which should be avoided. Any new programs that are developed in the technical fields should be based on clearly defined needs on the local and state level.

In spite of all the money that appears to be available at the national level, we're having great difficulty in finding enough money to do what we know should be done in technical education. The legislature didn't give us sufficient funds to do all the things that we think are vital to the people of this state. Therefore, we have to establish a priority order in everything we do. While the 1963 Vocational Education Act put quite a few dollars in the hands of the state for technical education, we must at the same time recognize that this whole spectrum of technical education needs has stretched out in the meantime. The bulk of the 1963 Act dollars are going to go to post-high school, non-college level programs. As I look around the country I see very few associate degree and other college level programs being supported by dollars under the 1963 Act, even though they're clearly eligible for support. This means that we probably will have to have more federal legislation to support this element of the technical education. Also, the need for funds for technical teacher education should be clearly spelled out in the form of more scholarships and additional fellowships to attract graduates of the associate degree programs into effective technical teacher education programs.

This two weeks should bring out the broad range of differences that I know lie in this whole diverse field of technical education. Don't be at all inhibited about calling anybody on any point. You shouldn't go away from this conference with anything kept to yourself. I hope you don't ignore the whole problem of the background of your technical teacher. Should they be engineers with industrial experience? Should they be industrial arts people with special experience? What should they be? Tackle these problems, because out of this will come reports which will go a long way in determining the direction of technical education in this country.

The Role of the Technical Teacher

Lynn A. Emerson*

This presentation is going to take the form of an overview of many of the items that will be discussed later in this program in greater length. Briefly, I want to mention such things as the changing setting in which the technical teacher works and the nature of the product of technical teaching because I think we have to look at the objective of technical education: what is the technician anyway? What are the types of technical teachers needed? What is the basic task of the technical teacher? Helping persons to learn is his task and I will describe what the technical teacher needs to accomplish this, how he gets it and a little about the technical teacher in the years ahead. I'm going to concentrate mainly on the two-year post-high school program because I think that this is the area where most technical teaching is going to be done.

We have a considerable amount of technical education in the high school at the present time. Twenty percent of the technical education that is subsidized under Title III of the George Barden Act is in the high school. It is largely concentrated in certain areas, New York State, Pennsylvania, a little bit in states like Maryland and Connecticut.

The Bureau of Labor Statistics has come out recently with a bulletin which I hope all of you have received, "Technical Manpower." It's out of print now, but it contains much good information. One of its tables lists the technicians who enter the labor market from formal education sources now and contains projections to 1974. At the present time, forty-one percent come from the post secondary programs, which by 1974 a rise to 60.5 percent is predicted. That is a fifty percent increase in a relatively short period. Certain numbers come from MDTA programs, college degree holders in engineering who take technician jobs, college engineering drop outs, and college graduates in science. Those trained in the armed forces aren't expected to change much. At the present time forty percent of the total number of technicians are products of formal training within industry, but this is expected to drop to less than twenty percent by 1974.

Let's look at the task of the technical teacher. What is his main task?; What is he paid to do anyway? In the first place, he is paid for teaching; second, for incidental occupational guidance for his students; third, for maintaining satisfactory faculty status. The third point may not mean being chairman of an important committee that takes him away from his job so much of the time that it's troublesome, but only maintaining satisfactory faculty status. He is not paid for writing for publication, doing research, nor for exercising leadership in professional organizations. Even though these activities may be desirable for certain of these technical teachers and we have to have them, that isn't what he's paid to do. He's mainly paid to teach.

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For people on university faculties, the spectrum changes a little bit. If they don't publish, they don't get promoted. Not so with the technical teacher in the institution that we're talking about.

I would like to move on to the setting in which the technical teacher works. To look at the technological and socio-economic setting as I see it, let's look first at technological change. We have had more technological change since 1950 than we had in the previous half century. Since 1950, the word automation has come into our vocabulary, electronics has come into the picture in a way never previously thought of, transistors and lasers have been developed, and fluidic controls are now on the market and increasing in importance. We have new materials, new machines and new processes. Computers now routinely locate freight cars, make reservations, coordinate machine tools, and solve mathematical and analytical problems of various kinds. The technical teacher of tomorrow who doesn't understand and use the computer will be hopelessly out of date.

Let's look at some socio-economic changes that have taken place. Look at the effect of migration on California and Florida. The mobility of workers and the increased speed of travel is amazing. Some time ago I left San Francisco at three o'clock in the morning and at ten o'clock that night I went to bed in Bangkok. In between were Honolulu, Wake Island, Tokyo, and Hong Kong. That was a long day, but that's half way around the world. Of course it took a shorter time to get from Salt Lake to Chicago than it did from Chicago to Lafayette.

Another thing I think we must take into account is the increased age and grade level for occupational education. Now a very high proportion of the technical education is on the post-high school level and that movement is growing.

Another socio-economic change that is important is the Vocational Education Act of 1963. We're so close to this that we don't look at it as a change. Yet do you realize what that act means? If a state wants to do so, it repeals the Smith-Hughes and George Barden Acts, which Oregon has practically done. The Vocational Education Act of 1963 makes it possible to do things the way they should be done, instead of following a pattern that was good in 1917.

Another thing I think we have to look at from the point of socio-economic change is the new educational media. Programmed learning is doing a really fine job in industry. Closed circuit television, computer assisted instruction and all the rest are of importance to the technical teacher.

I think if you're going to talk about anyone who is doing something, you ought to talk about his objective, which for the technical teacher is to produce the technician. The technician requires both manipulative and the technical skills, with emphasis on the latter, and includes a great variety of jobs differing greatly in scope and depth. Technician jobs are found in research and design, manufacture and sales, operation and maintenance, and installation. Many other technician jobs are found in agriculture, business and marketing, and the medical and health fields. The payrolls often do not include the term technician at all, but rather list titles such as the engineering aide, inspector, tool designer, dental assistant, surveyor, engineering drawing checker.

I'd like to look at the teachers in industrial technology, the B. S. in technology and the like, and I think we've got four or five different teachers if we're going to look at them. First, you've got a teacher for the Smith-Hughes pattern of the skilled craft, who is a mechanic and whose main job is to spend three hours a day in a machine or carpentry shop. Then you have an industrial arts teacher. Then there is emerging a new teacher for teaching courses designed around clusters of occupations as recommended in the Vocational Education Act of 1963. You don't want just an auto-mechanic for instance, you want somebody who has breadth, and I believe that is where this B. S. in industrial technology fits. Then we have also a vocational-technical type of curriculum which is a kind of hybrid between the skilled mechanic and the technician. It isn't quite the industrial technician but it's something like that, a person who borders between a mechanic and a full-fledged engineering technician. We find a lot of those in the vocational-technical schools. Then we have the technical institute type of technical teacher that you are most concerned with here. All of these shades and levels come in and I think we have to recognize them.

What is the basic task of the technical teacher? It's helping persons to learn. Often we say it's teaching, it's more than that, it's helping them to acquire behavior patterns that are peculiar to certain jobs. The door of learning is locked on the inside and the only one who can open it is the student. The teacher helps him do it, and that's his task.

There are certain ancillary tasks that a technical teacher has, such as sometimes helping to prepare a total technical training curriculum. That's not really his job, but often it falls on him to do it. You don't ask a teacher of English to prepare a high school curriculum. However, in the technical field the technical teacher is often faced with extensive curriculum work. Teach the technology, teach the related work, plan the curriculum, plan the equipment list, all perhaps should be recognized as part of the technical teacher's role. We cannot train teachers to do all this, but we can make them aware of what the problems are. The technial teacher also has certain guidance tasks, helping his students understand better what the opportunities are in the field.

Manpower Requirements in Technical Education

J. P. Lisack*

Systematic determination of manpower requirements has been recognized as an integral factor in educational planning, especially in relation to occupational programs of instruction. Because essentially all of technical education is on the leading edge of the changing manpower picture, technical teacher education requirements and emphases also must reflect an up-to-date knowledge of the manpower requirements or face the alternative of delaying and retarding the implementation of new and expanded technical programs because of shortages of technical teaching staff.

I want to discuss a variety of background data and assumptions, which are basic to the overall manpower situation in the United States and are closely allied to technical education.

First, we live in a _job_ economy. About ninety percent of the United States labor force is supported through job earnings. The job economy system is complex, one reason for which is its environment of constant change: _technological_, _economic_, _social_, and _legislative_ changes are interrelated forces and aspects which tend to classify this change.

Significant trends, ranked from area of greatest increase to least, are: (1) National Income, (2) Productivity, (3) Employment, (4) Man-Hours Worked, and (5) Average Weekly Hours Worked (decreased).

Changing Employment Patterns

U. S. population is increasing about three million annually and the demand for products and services continues to grow. Employment has increased seventeen percent since World War II, with about 71 million employed in late 1963. But the characteristics of this expanding labor force have changed. Because of changing technology, new techniques, machines and materials, people today need different skills and better training than those of yesterday.

The largest gain in employment since World War II is in our public institutions. Government employment rose from 5.5 million in 1947 to 9.2 million in 1965; state and local governements are climbing in particular. The largest portion of this increase has been in our school systems--still struggling to catch up with the deluge of postwar babies reaching school age.

Another important trend is the slow growth rate in manufacturing employment. While output has grown about four percent per year, employment has increased at an average rate of less than one percent per year since World Ward II. Manufacturing employment now accounts for thirty percent of total nonfarm employment, down five percent from the thirty-five percent of fifteen years ago.

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Even more striking has been the trend toward employing more white-collar workers. While the number of production workers fell from thirteen million in 1947 to 12.4 million in 1962, the number of non-production workers--mainly executives, sales personnel, office workers, engineers, scientists, and other professional and administrative personnel--has risen from 2.6 million (16% of all manufacturing employment) immediately following World War II, to 4.3 million (twenty-six percent of manufacturing employment) fifteen years later.

Employment trends vary widely in different industries, for example, there were employment reductions in the primary and fabricated metals industries, reflecting the adoption of labor saving devices and increased foreign competition. (However despite a drop in production jobs, supervisory workers were upped 2% in the primary metal industries.) A strong exception has been the electrical machinery industry, in which employment has grown an average of 2.6% per year. This industry indicates an annual growth in supervisory workers of 5.4% on the average compared with 1.6% for production workers.

The nondurable goods industries registered a small annual increase overall, but the chemical industry has shown larger growth, due no doubt, to new product development.

The most highly trained of the nonprofessional workers (e.g. skilled craftsmen and foremen) have increased--their educational attainment is the highest of any manual workers.

Locating and Utilizing Manpower Data

Now I'm going to quickly talk about determining manpower requirements for a local educational setting. We can conduct surveys; making visits and conducting the necessary interviews. Through our state employment service offices we have data banks with rich manpower information and have many reports and publications that give us information which is classified in a number of ways. The normal SIC, or Standard Industrial Classification system, is expressed in four numeric digits; the first two giving the broad category such as primary metals or chemicals; the third giving a more specific classification; and the fourth giving the specific industry by product. Hence, a call to the state employment service in Indianapolis will provide me with the number of, say SIC Number 3316 firms in the state and the employment of the firms for any years requested. This information is also yours.

State employment service records and procedures are all computerized, so if you want to know how many people are employed in a given segment of pharmaceutical drugs, just look up the SIC numbers and make a call. The state employment service then is a wonderful place to obtain basic manpower data. Most states also have comprehensive industrial directories which classify firms by title, locale and product. Statistical information on employment, current trends, and labor turnover information are all available.

There are other avenues and places for matching jobs and men for skilled people. The employment service is not a good place for job vacancy data, but it is an indicater.

Experts in education and people from business, industry, government, and other sources should all participate in program content decisions which result from manpower studies. The development of core programs and job clusters are important considerations in curriculum design and utilization of consultants and representatives from the above described groups. Follow-up studies which close the loop to provide feedback of information on placement and job success are vitally important.

We just completed a study on draftsmen, design drafting processes, and the impact of technological change on drafting. The new computer controlled drafting machines and other devices have changed the role of the draftsman. Draftsmen today must be prepared with an eye focused on technological advances affecting their field.

I'd like to talk about the manpower data for community action. First, labor force utilization and growth are essential to the community's economic growth and prosperity. A community usually faces these kinds of problems and the vocational-technical education teacher, because of his talents, is in the middle of being able to influence the results. First, you have a supply and demand imbalance that occurs. This means retraining must be available and expected as well as proper initial training. In every community you have the unskilled and the unemployed who have to be reached We're talking about minority groups, handicapped, less well-educated, sometimes older women and men who find themselves unemployed. What is the cause? The lack of economic growth in some communities, inability of the community to absorb them, and seasonal unemployment all are factors. Community planning is necessary. You have to consider planning for land use, public utilities, etc., and education and training. You can set goals; you can generate jobs within a community with proper planning.

The core of the problem is good quantatative and qualitative manpower data, worked out through community action planning. Many representatives and planners in government, business, industry, social agencies, and educational institutions are often looking for the source of manpower data that they need as the basis for policy making or action. Manpower data lies at the core of many community planning and technical programs. There is no active single source or ongoing system or agency that provides this information. So manpower data is multi-faceted and complex; it has many unique variables within each community setting.

As a technical educator or a teacher or someone responsible in the administration, you cannot alone try to collect the manpower data, analyze it and go ahead with your program formulation. I believe it can be done and we can get better information through working together. By exchanging ideas we can help determine our manpower needs more accurately and thereby result in better vocational-technical education programs.

Use of Curriculum Guides in Technical Teacher Education

Walter J. Brooking*

The subject for this morning, curriculum guides in teacher education needs a little perspective. In the first place, there are many curriculum guides. We in the USOE have published a number of them which have been quite well received and are attempting to publish more and bring the others up-to-date. When we begin to talk about curriculum guides, first we must say, we nor no one else has ever sat down and really put together a definitive curriculum guide for the education of teachers of technicians. We attempted to get that funded three years ago and it fell through.

There are many other guides, some after the pattern of these as distributed to you. We need to examine carefully what we mean by a curriculum guide so that when we talk about using it in teacher education, we know what we're saying. I trust many of you are familiar with the general content of the existing USOE curriculum guides but first let's take an example. They are documents which describe plans for the preparation of the full time two year post-high school preparation of technicians in a particular technology. This one happens to be electronics. These guides are not dreamed up in our own little offices. They are the result of a contract with an institution with an exemplary and successful program in the area for which the guide is to be written. What is reflected in the curriculum outlines for these four semesters can be translated into quarters, and it contains the ideas of the persons who have this exemplary program with input from the numerous persons who have reviewed it. Leaders in institutions which have really successful programs have reviewed the guide and it essentially becomes a consensus of the best thinking available at the time. It contains some content and also some philosophy, both of which are important.

If we consider the content in one of these guides,it is a description which is aimed at giving a person who is to be in this special field what he needs to know, the abilities to do the things which he must be able to do, and a description of the environment in which he will work.

If you're going to teach a technician, first you must know what it is that he must know and be able to do. Who does he work with and all these things? If you don't know the content and have it documented and detailed, you cannot prepare anyone effectively to teach it.

Herein lies a concept which I would like to discuss in depth for a second, and that is the preparation of people to start in each of these programs. In each of these guides there is a statement of the courses or the capabilities that students must bring to the program to begin. I think one of the most serious problems in this nation, in front of all technical education and particularly relating to the physical sciences, is the shortage of qualified people to begin these technical programs. We have to explore the use of pre-technical programs. There are a number of them around the country.

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The concept of the pre-technical program is that you take youngsters who have finished high school and neglected to get the mathematics and science necessary to become technicians. There is a huge population of these perfectly capable youngsters, probably as large as the number of those who have finished and are already going to college. That quality youth who wants to be a technician and isn't prepared has the doors closed on him because he isn't ready. We must set up programs, get them into the lab the first year but teach them their mathematics and science usually for a year or a semester. It's a new concept but we're going to see a number of such programs start around the country this fall and several are now in operation.

As we train teachers to train technicians in the technical specialty, we are essentially training not only the classroom teacher of the technical specialty; we are also training the department head. He is the man who has to recruit students and know what these requirements are, and help in the surveys to find out what people need to know, and analyze this kind of thing. He is the man who probably will be involved with advisory committees, keeping this thing on the ground and making it make sense locally and regionally. He must exert the leadership that will draw into and coordinate the efforts of everybody who is involved in teaching technicians.

In teaching teachers, we must look at these questions, what kind of teacher training programs are we going to talk about? Pre-service, professional, four-year programs? Then there is the technical institute kind of program which may be preparatory for teachers preparing to teach a subject for the first time, or who are attempting to teach it but do not feel prepared.

Let's look at three of these groups now. For those who are planning a full time preparatory program for new teachers the information contained in the curriculum guide or some modification of it, must be included. It becomes the substance of what these people have to know and have to be able to teach. Taking youngsters out of high school, putting them into college and prepare them to be teachers, implies only interest rather than work experience in the field; they want to be teachers. This implies that they would have to have the mathematics that a technician would need and some more. There has to be a greater depth and in a sense, if we draw a line and say that this is where a technician's education stops, we've got to go deeper for the teacher. A teacher must be able to go farther than he must carry his students to effectively teach.

There needs to be a considerable emphasis on the science and the supporting mathematics. Science is going to have a great effect on the teacher as he addresses himself to the changes to which he must adapt. The technician who graduates and gets a job has to stay on top of it too, but the teacher, unless he has considerable depth in science, can't keep up.

As an approach to teaching, the guides have a lot, but there are certain things they do not have. They tell what the technician needs to know, but do not get into the pedagogy which a teacher must have. Many of us believe that a minimum pedagogical exposure for beginning teachers is an absolute essential. We're not so sure that a lot more is necessary at the beginning. It is something that is not included in the curriculum guides.

Preparation of Engineering Technology Teachers at the University of Illinois

Jerry S. Dobrovolny*

I've been somewhat interested in technician training for several years. The Department of General Engineering and the Vocational-Technical Department (through Ray Karnes) became involved in program implementation of an associate degree program. We organized several conferences throughout the state to educate the people as to what technical education would be under Title VIII of the National Defense Education Act. We envisioned this as a post-high school associate degree type of activity. The first thing we got involved in was where to get the teachers for these programs. We didn't see any great number of the people coming from the ranks of engineering. We found a few people from industry who had taught in night school programs who were potential staff members. But the bulk of people who were moving into this were people with an industrial education background who had some industrial experience or from vocational education.

These people we have been working with in our summer institutes have pedagogy coming out of their ears. Most of them have master's degrees on how to do it, and we had very little problem in identifying methodology. We then concentrated on the subject matter. The program at the University of Illinois is to prepare teachers for engineering technology programs. One of the first things we had to do was to identify what a one or two year associate degree program might be, and to determine the subject matter that these teachers would be teaching.

The first institute was funded in 1961, and we have one going every year--this is our seventh. We found that there were a large number of vocational and industrial arts educators who have some mathematics, physics and science background. We took this and built on it. We provide an immediate and intensive refresher course in the basic algebra and trigonometry. We had to put these people in the eight week program reviewing calculus and differential equations and then we bring them into math and the systems they will be working with in electronics. We have involved here a three summer sequence.

In 1965 and 1966, we had what we called our basic program. In the mechanical area we took statics, dynamics, a course in trigonometry and one in algebra. In the electronics area we took a different math, primarily calculus, and a course in industrial electronics. This summer in the mechanical area, we are giving them a course in the strength of materials, basically, and then a course in mechanism analysis; in the electrical we are giving them a basic circuit analysis course along with the advanced math in differential equations. They also come together twice

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a week in a seminar on technical education. From this comes our desire to provide a program in the university to train teachers for these types of programs of engineering technology. A proposal using B. S. graduates in other disciplines was approved by our college of engineering and college of education. The graduate college "shot this down" and the reason for this is that here you are taking people with a B. S. degree; giving them coursework that is essentially being taken by sophomores, juniors, seniors in engineering; and giving graduate credit for it.

A second committee was organized and when we got all through, we educated these other people as to what the problem was and they recommended unanimously that we establish an undergraduate program in the preparation of teachers of engineering technology and then in the interim, to have a post-baccalaureate certificate for the people that we were working with in the summer institute. A post-baccalaureate certificate was awarded as a means of identification for completing a sequence of courses and reaching a certain level of subject matter competency. This certificate is equated to a subject-matter masters for teaching in the community colleges and has worked out quite well. We will work towards a master's degree after we begin to have a significant number of graduates from our bachelor's program.

A conference was held in November 1961 in the U.S. Office of Education. Most of the people who attended this conference came from the background of industrial education, industrial arts, vocational teacher trainers, etc. In our general discussion, it was decided that a good technical teacher, one that would teach in the two-year associate degree program, in engineering technology, should have basically three competencies--in order: (1) subject matter competency, (2) technical employment experience, and (3) pedagogic ability. Within the first day we agreed on the technical subject matter: (A) ability to use algebra and trigonometry as tools in the development of ideas and make use of scientific and engineering principles and an understanding of and facility with higher mathematics through analytical geometry, calculus and differential equations according to the requirements of the technology; (B) proficiency in the application of physical science principles, including the advanced concepts and laws of physics and chemistry that are applicable to the individual's field; (C) an understanding of the materials commonly used in the technologies; (D) an extensive knowledge of the field of specialization with an understanding of the engineering and scientific activities that distinguish the technology of the field; (E) communication skills that improve the ability to analyze and transmit facts and ideas graphically, orally; and (F) the ability to interpret and apply principles in economics and industrial relations that will apply to a technology. The technical employment experience should be three to five years of high level related experience.

A brief breakdown is:

1. Basic sciences include the math, chemistry, and physics with thirty-two semester hours.

2. Engineering sciences include graphics, static dynamics, strength of materials, basic circuit analysis--fourteen hours.

3. Technical specialty includes machine design, industrial electronics, etc.--thirty-eight hours.

4. Education includes six semester hours of supervised technical employment experience--twenty four hours. Then there is a five hour practice teaching requirement. That leaves us with thirteen hours.

5. General education requirements of all our curricula in preparation of teachers amounts to twenty-eight hours.

6. Total: one hundred thirty-six hours.

Students in this program will be taking the same courses as our engineering students will be taking in the machine design--statics, strength of materials, etc. You ask, "What's the difference between ours and the engineering program?" First of all, we are not going into the depth. For example, we have two courses in physics rather than three. We don't take all of the thermal dynamics, heat transfer, etc. as the engineers would take.

We hope in the future to place some of our people in technical institutes to obtain practice teaching experience.

We feel that probably our best source of students to complete this program would be graduates of the associate degree program in engineering technology.

In the summer of 1965, we had a USOE sponsored program for high school drafting teachers. A basic premise was that we could take a selected number of these people and upgrade them over a series of summer programs to qualify them to teach in an associate degree program of engineering technology. We found that mathematical knowledge is our most accurate predictor of success in a program of teacher education.

The economic condition of these people is not so great that they can take a summer off to go and pick up the needed subject matter. Most of these people are making $6,000 - $8,000 a year and they need that summer work to catch up on some of their bills. So without USOE support, we would not have been able to have the success with this program that we had. One of the things that the USOE needs to do is to quit pouring money down the drain with these stupid research projects that they're carrying on and put it into teacher education. If you are going to have meaningful programs, you're going to have to get the teachers.

Preparation of Technical Teachers at Okalahoma State University

Maurice W. Roney*

I think I'll start with a description of the Oklahoma State University program and move from there into some of the underlying philosophy and talk about professional standards over and above the teacher education program. Well, the B. S. degree in technical education is designed primarily for graduates of technical institutes or junior colleges who have completed an associate degree program in a specialized field of engineering technology. The master of science program is designed for graduates of engineering or physical sciences curriculum or for those who have a background of mathematics and science equivalent to that of a graduate of the B. S. degree program in technical education. The degrees are taken in the college of education and the technical coursework is provided by the college of engineering. This is where we differ from the University of Illinois program, and if you understand anything about higher education institutions, you know that these things come about because of patterns of administrative operation within the university and no two universities are alike in this respect. At Purdue you see a little different situation too, because it has a school of technology. Each pattern has certain advantages, and I think we'll be interested later on in what these advantages are.

In special cases, where individuals have a background of pre-engineering or science, the technical coursework is provided by the technical institute, a division of the university with full facilities on the Oklahoma State University campus.

With regard to coursework, forty semester hours of technical coursework may be obtained by direct transfer from a junior college or technical institute. This is the technical coursework and it includes both the field specialization and any auxiliary technical courses that they may have. Now credit may also be obtained by validation examinations if the individual has completed technical courses at non-accredited schools.

The engineering and science requirements of this particular curriculum are fourteen semester hours and consist of upper division courses selected by the student and approved by his advisor. The twenty-six credit hour requirement for mathematics and science includes the necessary prerequisite for upper division junior and senior level engineering courses. Students enter this sequence at the level where they can do satisfactory work.

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*Dr. Roney is Director, School of Industrial Education, Oklahoma State University.

The engineering science requirement of fourteen semester hours consists of upper division courses. These are, as are Jerry's, regular engineering courses. They serve our purpose pretty well in most instances. There really isn't much of an alternative, unless you've got a big operation where you can offer special courses. We couldn't, for example, within the college of education, by any stretch of the imagination, set up advanced coursework in the fields of mechanical, chemical, electrical, and all of these various fields.

We work with the registrar in a real fine relationship. We've got some people in our registrar's office who will do anything that we want done, as long as we don't abuse the privilege, as long as we look to this individual and say this is a special case where this individual may need something a little different from the regular.

For professional education, which Jerry loosely called pedagogy, I'd say ours includes a carefully structured block of four courses taken in sequence and designed to provide an introduction to technical education, occupational analysis, fundamental teaching techniques, and the essentials of curriculum and program planning, and believe me there's a great deal more in that than pedagogy. The only pedagogy would be in the third course, which is fundamental teaching techniques. This is a three credit course which includes both methods of teaching and preparation of materials.

The non-technical courses make up about two-fifths of the curriculum and include humanities, social science, and general education as you would expect to be required in any regular baccalaureate program. The degree requirements are written out here specifically: 40 hours of technical, 6 hours of mathematics and science, 14 hours of engineering and science, 13 hours of professional education, and the package is there. The 13 hours includes those courses I talked about.

Now, moving quickly into the master of science program, the candidates for the master of science degree in technical education must meet the general requirements of full graduate standing; they must complete 24 hours of approved coursework, and this breaks down three ways, one-third technical, which means either upper division or graduate courses in their specialized field, one-third research, because we feel that research is an increasingly important part of all graduate students' work, and about one-third professional in technical education again. It's interesting that we take the graduate of our program and we give him additional coursework in such things as comparative technical education and curriculum planning and advanced work beyond what he had in the undergraduate program. However, if we bring in somebody from the outside, who has not had much understanding of the whole picture of technical education, we put him right back in this same sequence of courses, technical education, occupational analysis, and essentials of curriculum planning, because we take the individual from where he is to where we want him. Now we do have a thesis requirement which we require for everybody, except those who have administrative experience or foreign students, which is our option not the students' option.

We have had 105 graduates of our baccalaureate program, 27 masters, and 3 doctorates. The doctorate program is in education and we're planning a very useful combination of higher education and industrial education.

There was one other point that I definitely wanted to make, and that was with regard to the need to set a professional standard for teachers in technical education. I think every teacher in the field has a certain responsibility for professionalism in the field and for teacher training rather specifically. I think that if you feel that you can come up with a perfect teacher training program and turn it over to an institution and your problems are all solved, you are sadly mistaken. I think everybody in the profession has a responsibility for setting certain standards that can be met and then helping the institutions and the state departments of education meet these standards.

If you are concerned about your own image, your own cohorts, your own position in the system, then you have to take a major responsibility for setting professional standards, you can't leave this to the state department of education, or the university teacher training program. In a final analysis, your professional standards are set by administrators. Unless you take a position and put the bee on the administrator; and you as a teacher, have to do this sooner or later, because if you don't the administrators are going to set the standards. Technical teachers should have a B. S. degree. We didn't care what it was in, but they should have specialization in a technical field which includes coursework at a level above that which he is to teach. The Oklahoma Technical Society finally arrived at the recommendation that a man should have a B. S. degree, with a specialization in a technical field which includes coursework of a level above that which he is to teach.

The industrial experience you can argue about. This group came up with a minimum of six credits in professional education, which I think is pretty reasonable, but they put a specific tie on it. They said that you should have six credits in technical education and they gave him three years to get it if he comes in without it. The important thing is that these people as a group agreed that they should have six credits in the subject matter of technical education, per se. Now I also mentioned in the initial talk to the Oklahoma Technical Society that we professional educators in the university are obligated to provide whatever the Socity comes up with. Because the Society has to be realistic, it must program something that's attainable and yet has enough meat in it to make it meaningful, worthwhile, and agreeable to the group. I'd like to see you at some time kick around this thing in the light of a profession setting its own standards, rather than depending on teacher education institutions and state departments.

The Purdue Technology Teaching Program

Joseph P. Arnold*

The present Purdue program in technology teaching was approved by the School of Technology in Spring, 1967. It replaces a previous program, with which it shares some commonality and which had been in operation since 1962. Experience with the older program indicated that major changes were necessary to attract adequate numbers of students and to provide the flexibility needed to extend beyond the engineering technologies. Nearly total focus on engineering and a "five years plus" time involvement for students who enrolled in the program were considered but two of the basic reasons why a very limited number of graduates were produced. In brief, the requirements of the older program were unrealistically complex and demanding to allow it to compete with other baccalaureate programs in attracting students and did not fit the broadened technical programs which have evolved since the School of Technology was formed.

Designing the Program

Several assumptions were apparent during the program development, which are:

1. A balanced baccalaureate program could provide the technical competence, professional preparation, and other background necessary for entry into technical teaching.
2. Selected graduates of Purdue's sixteen associate degree curricula provide an ample and appropriate population of potential students; current enrollment is in excess of 2,600.
3. Most community colleges, technical institutes, and other employing institutions would employ graduates of a good baccalaureate program, realizing that in most cases the new technical teacher would be required to complete a graduate program as a condition of continued employment.
4. The baccalaureate program must contain an adequate liberal background to qualify the student for admission to an appropriate graduate program.

The Program

The program is designed to provide selected, interested graduates of Purdue's sixteen associate degree curricula with the basic qualifications for teaching technical subjects in college level and/or adult education programs. The entering student will build the third and fourth years of his college work from the advanced technical, mathematics, science, general studies, and professional courses considered a necessary part of the background of a teacher in a technical institute, junior college, or other institution offering technical programs. Hence, he will become a teacher in programs designed to train technicians and other persons of similar job level.

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* Dr. Arnold is Associate Professor of Industrial Education, School of Technology, Purdue University

The major inclusions of the program are summarized as follows:

		Semester Hours
Mathematics	through integral calculus, additional courses recommended in engineering technologies.	11
Science	chemistry and physics	14
General Studies	English, speech, psychology, sociology, and others.	27
Technical	Associate degree (30-55 semester hours) plus a minimum of 12 semester hours advanced.	42 minimum
Occupational Experience	Cooperative technical work experience or evaluation of previous experience; 1 year full time. (minimum)	12
Elective	Excess associate degree technical (beyond 30) is counted here; thus minimizing actual elective work taken.	13
Professional	Includes educational psychology, methods, occupational analysis, course construction, and student teaching (6 semester hours).	24
Total Semester Hours		143

Student Teaching

During the last semester of enrollment the student is placed in student teaching in a Purdue course. The potential teacher at this point will have completed most of his advanced technical and professional courses for teaching. The Purdue professor responsible for teaching the course and the student's adviser coordinate the activities of the student teacher to give him experience in the various activities associated with technical teaching.

Technical Work Experience

Students are required to complete a minimum of one year employed work experience in their technical area of specialty prior to graduation. The student who already has appropriate occupational background will be allowed credit for his previous work experience. The student who has yet to be employed in a position utilizing his technical background will be required to enroll in a cooperative plan involving the University and industry. Twelve semester hours credit is applied in either case.

Technical Teacher Education in Wisconsin

Philip W. Ruehl*

"Severe Teacher Lack Predicted" was the headline for an article in the December 25, 1966, issue of a major newspaper. "Needed by 1970, date of the opening of the new institutes under a plan passed by the 1965 legislature, will be at least 1600 new teachers." Coupled with this headline came pressure from the Wisconsin Board of Vocational-Technical and Adult Education and from some members of the Wisconsin Coordinating Committee for Higher Education. Furthermore, the political climate was right to receive financial backing from the legislature to launch a formal program for technical teacher education at Stout State University. To provide a high quality teacher for technical institutes is now a major goal at Stout.

Higher Education in Wisconsin

In order to talk about a specific program of technical teacher education at Stout State University, I would like to briefly review the relationship of the public institutions of higher education in Wisconsin. In this state the Coordinating Committee of Higher Education, has supervision over four different types of institutions; (1) the County Normal Schools, (2) Vocational-Technical and Adult Schools, (3) University of Wisconsin, Madison, and (4) Wisconsin State Universities.

Of the institutions only two State Universities, Platteville and Stout, prepare industrial education teachers for the secondary schools and only Stout has a degree program for vocational education; and, effective in September, 1967, a formal program to prepare technical institute teachers.

Technical Education Curriculum

I would like to turn now to the explanation of the first of a series of technical teacher education curricula which I hope to initiate at Stout State University. Because of the need for electronics teachers, and because of the competency of the staff in this area, electronics technology was selected as the first curriculum to be prepared. Attached to this paper is a copy of the curriculum as it was accepted in April, 1967. Let me digress for a minute to say that over the past years Stout has graduated many very successful technical teachers. These teachers came to Stout well prepared with industrial backgrounds and many with excellent training received in the military service. The formal training received at Stout provided them with the academic and professional courses they needed to prepare as teachers. The program I am about to explain provides an opportunity for a freshman to pursue, as his educational goal, the teaching of a technology in a technical institute without his having had previous industrial or military experience and training.

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*Dr. Ruehl is Coordinator of Technical Education, Stout State University, Menomonie, Wisconsin.

Certification requirements and results of other studies point out that a competent technical teacher must possess: (1) a depth of technical knowledge beyond that of his students; (2) a strong general education background; (3) a knowledge of how to teach; and (4) related industrial experience. A serious attempt has been made to include all four of the listed requirements. Of the 130 semester hours required for graduation, 30 credits are in the technology, 12 are in related technical work, 68 are in general education, and 20 are in professional education. Built into the program are two supervised summer field experiences, each three months long. This related industrial experience is done under the supervision of our field experience coordinator.

Prior to the adoption of the electronics curriculum, local committees and a visiting consultant, Mr. Jerry Dobrovolny, reviewed and criticized it. An advisory committee of one person from each of the 16 technical institutes also reviewed the curriculum. I am very hopeful that a curriculum of this type will attract many very able students and provide competent teachers in electronics.

A study is now being made of the technical competencies required by a mechanical design technology teacher. Upon completion of this study, a curriculum for mechanical design teachers will be prepared for adoption. Other technologies related to our existing program will be explored for technical education curricula. Because of the budget and staff requirements needed to do a quality job of teacher preparation, there is a practical limit in the number of different technologies that can be developed at a small institution. It may be that inter-institution cooperative programs will permit the training of teachers in special technologies.

The graduate school at Stout will be playing an increasing role in technical education by providing an opportunity for those who now hold a first degree in engineering or industrial technology to obtain an M. S. degree in vocational-technical education. About one and one-half years will be required to complete the degree.

Certification courses held in extension centers and supervised on-the-job teaching experience will also provide another way in which a person who has a first degree, and is competent in technology, can become a technical teacher.

Thank you for this opportunity to present our beginning program for preparing technical teachers.

Current and Anticipated Demand for Technical Teachers

Alan R. Suess*

Accurate information concerning the demand for teachers of technical subjects is extremely difficult to obtain. Educated guesses, the number of telephoned pleas for help in locating qualified staff, and similar "empirical sources" currently indicate more positions than qualified personnel. Lacking, however, is a recent assessment of present and projected needs by technical speciality.

Faced with this lack, the Industrial Education Department at Purdue recently undertook a survey of technical programs to ascertain teacher needs. The population for the survey consisted of all institutions listed in the "Directory of Institutions Offering Technical Training" in the 1965-1966 edition of the Technician Education Yearbook. A random sample of 108 institutions was selected from the 871 institutions listed.

Ninety-eight institutions responded to the survey. This represents a ninety-one percent return. Table V summarizes the survey results for current technical teacher needs, two and five year projections of total staff needs for technical specialities listed by five or more institutions.

The one and two year vacancy listings give an indication of the current need and probably reflect current staff availability as well as need. The five year projection, however, gives us a look at the needs at a time when four-year graduates in technical teaching specialities will be ready for the job market. The need is real, the exceptionally high rate of return probably indicates the urgency of the staffing situation and the mandate is before us. We must take effective action to meet the staffing needs of institutions preparing technical specialists.

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*Dr. Suess is Associate Professor of Industrial Education, School of Technology, Purdue University.

TABLE V

CURRENT AND PROJECTED TECHNICAL TEACHER NEEDS

Technical Area	Current Vacancies	One Year Estimates (1968-69)	Five Year Estimates (1973-74)	Number of Institutions Listing Positions
Electricity/Electronics	263	303	453	70
Nursing	89	83	148	39
Mechanical	45	39	93	23
Scientific Data	39	41	105	31
Automotive	37	41	81	22
Agriculture-Related	28	39	85	33
Health-Related	27	31	81	31
Drafting-Design	26	32	58	27
Civil	23	20	59	26
Secretarial	21	19	29	15
Industrial	19	25	52	18
Retail	18	29	39	20
Business Administration	16	24	28	14
Clerical	15	12	15	8
Machine Tool	14	12	19	14
Aeronautical	14	25	34	11
Chemical	14	13	19	8
Accounting	10	8	15	12
Welding	10	15	24	7
Food Management	9	8	13	10
Police-Fire	7	3	7	5
Child Care	6	7	22	5
Environmental Control	6	7	6	11
Metallurgy	4	12	16	6
Architectural	4	5	29	6
Instrumentation	2	6	11	7
Total Vacancies	797	887	1,584	

Comments on Technical Teacher Background for Technical Teaching in the Electrical Technologies

Gilbert R. Rainey*

To start the discussion, we should identify the requirement of a graduate of our EET Department. We have an electrical engineering technology program which produces electrical technicians. We have a bachelor of science program, a continuation of the associate degree program, that would produce technologists. In addition to this we are involved in adult evening education classes. We classify the technologist as a four-year person. We have an engineering technology program which students from high school enter. After two years they receive an associate degree in applied science. We call this person an engineering technician or a technician depending on the area in which he is working.

At Purdue engineering technology is a college level program. By that I mean our courses are accepted as university courses. In our engineering technician program we use the speech courses, English, other supporting courses; in fact many of the same courses that are used in our engineering curriculum. Now the student can continue his education after two years at Purdue. He can move into the normal flow plan for the bachelor of science degree. We call it a 2 + 2 plan. After two years he can either leave us and be employed in industry, transfer into the B. S. program. We call the person who graduates with the B. S. degree a technologist. So we have an associate degree technician and a bachelor of science degree in engineering technology, the latter of which we label a technologist. What is the difference between the electrical technologist and the electrical engineer? An electrical engineer today is trained to move into the design area. His mathematics starts at calculus; he is primarily being educated to move into the research and design areas. At Purdue we start this man with Math 161, Mathematics for Engineering and Science. This is a course in calculus and analytical geometry.

Now what is the objective of a technologist? First we feel that the engineering technician, the first two year step you'll recall, will move into the industries in a supportive role. He will support engineers, physicists, chemists; he will be the hardware expert. He will be the instrument expert, he will concentrate on working with equipment. The modern engineer does progressively less of this. When we move into the technologist area, what additional capabilities does this person need? There is in this country a shortage of well qualified technical personnel in our small, medium and even large manufacturing industries. Engineers in the past went into these industries and kept them operating. They used to get the product out the back door, and the engineers were primarily responsible for this. We're attracting fewer and fewer engineers into our manufacturing industry; we're facing a tremendous shortage of technically trained people that coordinate the activities of people and machines to keep industries running. We feel that this is the place that our technologist will find his place.

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*Professor Rainey is Head, Department of Electrical Technology, School of Technology, Purdue University.

Mathematics and Science Requirements for Technical Teaching in the Aviation Technologies

James R. Maris*

We're rather unique in the Department of Aviation of Technology, in the fact that we have quite a few federal regulations to meet along with the university standards for faculty curriculum development. Our programs are very highly regulated in the matter of establishing curriculum and employment of staff.

The programs fit into the category of an industrial technology. The programs are threefold, basically involving maintenance, electronics, and piloting.

The aviation maintenance program basically consists of two years of training. The young man receives in this program all of the basic requirements put into it by the FAA for the hand skills involved. Welding, sheet metal work, wood work, fabric work and aircraft inspection. This technical type of aspect relates to aviation, as well as English, remedial reading, technical report writing, speech, physics, heat, light, sound, electricity, algebra, trigonometry and slide rule. The basic requirement is set by the FAA and the mathematics is only algebra and trigonometry, Math 111 and 112, although over seventy percent of the students in this program are going through a higher level mathematics, Math 151, a lower level engineering mathematics.

The aviation electronics program is associated with the aviation aspects of electronics. The student will start out with an AC and DC course as related to aircraft components. Then he will move into a communication navigation course as related to aviation navigation gear and communication gear; then into an integrated systems course. At the same time courses in vacuum tube principles and electronic circuits. Along with this he gets basic courses on campus, including a physics course. If a boy graduates from maintenance or electronics, he has a good opportunity for employment as a two year-graduate.

Our third associate degree program is called General Aviation Flight Technology. Taking a high school boy and putting him through a two-year program, and giving him a commercial and instrument rating is the intention of this program. During the program he will have training in such things as industrial psychology, business accounting, management, English, mathematics, science; all tied in with flight and ground school. This is General Aviation Flight Technology. He gets two hours in the trainer before he sees an airplane. We have incorporated training to become a flight engineer.

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*Professor Maris is Head, Department of Aviation Technology, School of Technology, Purdue University.

The instructor who is teaching my aviation maintenance mechanics needs basic mathematics, trigonometry, and geometry. He doesn't need calculus. This is not an engineering technology as we have it structured. His instructor, of course, needs that. We need a lot of science for technology. The instructor has to know the basic laws of physics and it must be applied physics.

The qualifications for the instructor in aviation electronics should include higher mathematics. More science and physics are needed to be well qualified.

For the professional pilot instructor, the young man must be competent in physics. His mathematics just has to be functional and practical. He has to have algebra, and know how to use the aerial computer. A pilot's life is built around these computers. He computes his fuel range, his navigational course on a computer. He has to know basic mathematics and doesn't have to know calculus.

Science and Mathematics for Teachers in Nursing

Helen R. Johnson*

Nursing is just one of the health technologies; it is not the only one in the health field. It is the first started, but now there are many others in junior colleges, etc. The associate degree programs in nursing started in the early fifties. They had very good planning and sound curriculums from the very beginning. They were started as a result of a study done by Dr. Mildred Montague. She had been studying the role of registered nurses in positions below the level of the professional nurse and yet above the level of the practical nurse.

In considering how much science and mathematics the teacher of nursing needs, I think we have to take a look at what students in the technical program get and the amount of both science and mathematics varies. Mathematics varies from zero to six semester hours in most of the associate degree programs that I have reviewed.

In science from six to eighteen hours are required. Mathematics in the associate degree program is related to the need for the nurse to administer and compute drugs competently and divide dosage. This is usually a general mathematics course. In fact I've heard our pharmacology teacher say that a weakness of these nursing students is just plain old arithmetic. I think that the mathematics courses in the associate degree programs should relate to practical needs.

The science courses are usually anatomy and physiology, microbiology and chemistry. Chemistry is more frequently required for the nurse in the associate degree program because it is a prerequisite for work in a specific area such as microbiology, rather than actually necessary for all students in the associate degree program. Physics is occasionally in the associate degree curriculum, not always. The curriculum has about fifty percent nursing courses, and fifty percent general education courses. In those general education courses about half is the science and maybe mathematics courses. The nursing courses are taught by the nursing faculty and these include the fundamentals of nursing, medical-surgical nursing, maternal child nursing, and psychiatric nursing.

Science learning is not an end in itself, but a way to help them understand the things that take place in the hospital, and how to deal with things and persons more effectively. It is extremely important for the nursing student to be able to make good observations and evaluations of the patient's physical progress. Also another thing that comes high in terms of patients' needs is the environmental needs of the patient, especially in the emergency and operating room. Seventy-seven percent of the identified environmental needs of patients are related to safety.

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*Professor Johnson is Head, Department of Nursing, School of Technology, Purdue University

We don't expect the associate degree nursing graduate to be a safety engineer, but we do expect her to know the safety aspects and recognize them, and to protect the patients.

I need to mention the places where a nurse will make these applications. They'll be incorporated into her discussions, in clinical conferences, and in planning for patient care, in teaching of patients, inverviewing of patients, in guiding and recording patients' bathing temperature, pulse and respiration, blood pressure, enemas, catheters, injections, etc.

I believe if I were to make a recommendation on the amount of the science and mathematics required of teachers getting a B. S. degree in technology teaching, I would think they would need these courses that are in the baccalaureate program now and that they should have the maximum number instead of the lesser one. This person would be expected to turn around and teach nurses these things. I would recommend at least six hours of mathematics for a teacher in technology, in physics at least four, and between ten and thirteen hours of chemistry and in microbiology approximately eight to ten. In anatomy and physiology at least ten semester hours should be required.

The 6 P's of Employing Technical Manpower at Purdue University

Walter E. Thomas*

The 6 P's

A) Preferred Prerequisites - the educational and vocational backgrounds we prefer our faculty members to have achieved.

B) Prestige Pressures - what our colleagues from other parts of the University would like for us to have achieved.

C) Permitted Prerogative - what we really have achieved.

Background facts

A) There are no community colleges or junior colleges in the State of Indiana. Rather, the state utilizes the regional campus concept.

B) Purdue University has four regional campuses. In addition, some technical programs are offered at three Indiana campuses under a guest-host agreement.

C) The School of Technology was formed in 1964 to administer all associate degrees at Purdue University. There are 16 associate degrees and 10 baccalaureate degrees offered by the School.

D) The five engineering technologies offered by the School include Civil, Electrical, Industrial, Mechanical, and Metallurgical Engineering Technology.

E) Purdue University faculty consider the Engineering Spectrum to include college level curricula that will cover the four following categories: Engineer; Technologist (4-year engineering technician); Engineering Technician; and Technician (called Industrial Technician and Vocational Technician in some areas of the United States).

F) Purdue University offers programs in all four categories - the first in the Schools of Engineering and the last three in the School of Technology.

Preferred Prerequisites

A. Hiring

1. Bachelor of Science degree in Engineering

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*Professor Thomas is Head, Department of Manufacturing Technology, Purdue University.

2. A Master of Science degree - preferably in Engineering, Administration or Education

3. A minimum of five years of meaningful industrial employment.

B. Promotions

1. Faculty may be promoted at Purdue University for excellence in teaching, excellence in research, or excellence in service. (Last year approximately 50 percent of the faculty were promoted for good teaching.) Purdue thus feels that a man worth hiring is worth promoting providing he is doing an outstanding job in the area of his speciality.

Prestige Pressures

A. Hiring

1. Other Schools require a doctorate before being employing faculty in the professorial ranks. (Currently there are no doctoral programs in Technology.) For the School of Technology to hire Doctors of Engineering would mean that their faculty and the Schools of Engineering faculty would have identical backgrounds. It therefore follows that they would have identical programs, which is not the purpose of the School of Technology.)

B. Promotions

1. Many faculty feel that to be promoted to Associate Professor or Professor one must have obtained a doctorate. (See comments under A 1 above.)

2. Many faculty feel one must have publications before being promoted to Associate Professor or Professor.

3. Some of the faculty feel that the School of Technology offerings are subcollegiate and as such the School's faculties should not be eligible for promotion. (All courses are collegiate being transferable to other institutions of higher learning.)

Permitted Prerogatives

1. 28 of 33 faculty members have a Bachelor of Science in Engineering.

2. 26 of the 33 have a Master of Science degree. (Six of the seven without Master's degrees have been with the University over five years - predating the formation of the School of Technology.)

3. The average meaningful industrial experience for the 33 faculty members is slightly over 8 years.

4. Last year the Department also employed 2 graduate instructors and 4 undergraduate instructors. (These six were assigned to full time professors as assistants and aides for the teaching of multi-section classes.)

5. No new full-time faculty members will be employed without a Master of Science degree except those with a Bachelor of Science in Engineering who are willing to complete their Master's degree in a period of 5 years or less.

6. The Department has hired three retired military officers who have completed their Master's degree in Engineering. The Department feels that twenty years or more military experience is certainly equivalent to five years or better meaningful industrial experience.

Closing Remarks

The School of Technology is indeed fortunate to be a part of the Purdue University faculty because of the broad educational concepts that this faculty believes in. Promotions for teaching or research or service attest to this fact. Without this understanding the School of Technology faculty would indeed be second-class citizens.

Another item enhancing the School's role at the University is the fact that all of the Engineering faculty who understand the role of the modern engineer unqualifiedly support the engineering technician programs offered. The cooperation between the Schools of Engineering and the School of Technology allows Purdue University to provide educational opportunities for students in all four areas of the engineering spectrum.

Finally, our faculty are dedicated to teaching - they are not pressured by the need to publish or to do research. The industrial experience they bring to the classroom provides invaluable educational opportunities for the students that is literally impossible without such a background. The prestige that is lost by the lack of the doctorate is more than compensated for by the prestige gained in industrial circles because our graduates are "job ready and willing to perform any assigned tasks."

Thank you for allowing me to depict to you many of the considerations we feel important in the employment of engineering technology faculty in Purdue University's School of Technology.

Technical and Occupational Background for the Technical Teacher of Agricultural Programs

G. Allen Sherman*

I'd like to start out by stating what I think are the desirable traits of agricultural technicians. First of all I think he needs to be more technical than the high school vocational-agricultural teacher that we've been used to for so many years. Their technical knowledge needs to be greater, and he needs to know more of the science of agriculture than the art of agriculture. He has to be less specialized than the Ph. D. in agriculture. Most of our Ph. D.'s are involved in research work. I don't think the teacher of agricultural technicians needs to be quite as specialized as the Ph. D. in agricultural research.

He must be teaching oriented rather than research oriented. If they're going to be hired to teach technicians, teaching is their number one job, and not doing research work on the side. He's going to have to be a master of skills in his speciality, and this means that he needs to have not only theoretical background, but some skills work somewhere along the line. He also needs to have some practical knowledge of the field with which he's dealing, because many of the problems that will come up will be solved through a practical knowledge. He needs enough professional education to do a reasonable job in classroom management, organize his instructional materials properly, and maintain control of the students. Possibly our technical students will not be motivated as much as the students in the professional programs. They need to be told continually how what they're learning is going to apply to the job they're going to have shortly, and they better learn it now, because once they get out on the job they'll need to know some of these answers. Another thing is proper educational philosophy for technical training. They need to have a little bit of the philosophy of technical education.

In agriculture, we basically are dealing with two kinds of teachers. The first of these I will call a professional full time teacher. The professional full time teacher in the junior college, area vocational schools, or universities, all three of which are offering courses for agricultural technicians. Some former students from the technician program who have gone on to the university and have become teachers are good to get back into your program to become the full time professional teacher. Others are successful vocational-agricultural teachers who leave teaching and go into an agricultural industry of one kind or another. Then we have another kind of teacher who may be a part time teacher or a full time teacher that comes to us from industry. He may be someone employed in industry in your community and he may come in and teach one or several courses in an agricultural speciality.

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* Mr. Sherman is Dean, Agricultural Science and Home Economics, Mt. San Antonio College, Walnut, California.

What are the advantages and disadvantages of each of these various types of teachers? First of all this fellow that comes all the way up through university training in school may lack the desirable technical experience that we would like to have him have. We would like to have all of these people, in addition to being regular teachers, to have three to five years experience in industry. This isn't always possible, but we'd like to have as much as possible, whether he's worked during the summers or interrupted his educational training and worked in industry for awhile after he's finished his university training or some other way. These professional teachers are usually better classroom managers than some of the others and I've had experience in hiring people from industry to come in and teach part time, and in California we're blessed with having to keep roll because we get reimbursed on the basis of daily attendance. We don't go by full time equivalent, we hope that this will be changed, but getting the teachers to get their reports in and keep a record of attendance and all these things that teachers must do in addition to being able to impart good technical knowledge to the student is sometimes a problem with these part time teachers from industry. They're doing another job by coming in and working for you part time and they don't always have time to do all of the things that they have to do and it seems like on our campus there gets to be more paper work all the time, and we have to continually be on these people to get this in. The part time teachers are usually more up-to-date on the latest technical developments in the field than some of our full time professional teachers so there are advantages and disadvantages to each.

When we get down to the bachelor's program, talking about what kind of training we want these people to have, I came up with one that I think would be desirable to have if I were going to hire teachers. I'd like to fill this out for you for your deliberations during the time that you are here. In agriculture, I would start out with maybe 45 units, approximately; the basic sciences and mathematics, including physical science, biological science, and mathematics, chemistry, zoology, botany; those kinds of subjects.

This would be matched about the same, 45 or 46 units in agricultural production courses. It's at this point that some of us in agriculture tend to separate. Some feel that all of these production courses should be in one area, such as animal husbandry only. I don't know that I would agree with this completely, even if he's going to teach in this field, I would like him to have some plant science and agricultural engineering as part of his agricultural training. If he is trained only in animal science, he may not be too well qualified to teach a forage crops course, which is important to animal science, but involves a lot of plant science.

Agricultural economics and general economics should amount to about 12 units, including marketing. Marketing is practically our number one problem in agriculture today, one of the reasons is most students in the universities in the past have not had any marketing. Then agricultural education, possibly a couple of courses here. I hope that you wouldn't forget the humanities, maybe 15 units in humanities, maybe more; English, history, speech, psychology, sociology, and maybe in training agriculture teachers in the past. People should be able to converse on other subjects other than their speciality with other members of the faculty, and this training in humanities is going to help in this respect.

Health Service Occupations

Muriel A. Ratner*

To fully understand some of the problems associated with the development of health technology programs and the acquisition of qualified instructional personnel for a variety of educational settings, it is important to review some of the characteristics of the occupational area in general.

Health Service Industry

A. Third largest in terms of personnel engaged.

B. About 4.5% of total labor force (3,000,000 workers) are engaged in some aspect of health industry.

C. Three-fourths of those engaged in health services require special education and training for the services. The remaining fourth are engaged in services supportive to the industry.

D. Education and training for health services range from six weeks to as many as twelve or more years.

E. By 1975, it is anticipated that the country will require about one million more health service workers to keep pace with:

  1. population increase
  2. demand for health and medical services
  3. technological advances in medical and health services

F. Somewhere in the neighborhood of 200 specific health career opportunities have been identified and grouped under 32 major broad categories. (Health Careers Guidebook: U. S. Department of Labor, 12/65).

G. The greatest increase of workers will be required in health occupations requiring relatively short-term study.

Education and Training of Health Service Personnel

A. Evolved into present patterns from preceptor (M.D.)--tutorial and apprenticeship (R.N.) types of programs.

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B. Educational programs were centered in hospitals - which served dual purpose: patient care service and health personnel education and training.

C. With the exception of a few, most health service education programs are now pre-service.

D. Education and training for the health related professions is centered in a variety of settings: e.g. Programs in:

   1. Medicine, dentistry, nursing, occupational therapy, laboratory technology, etc.--in colleges and universities.

   2. Dental hygiene, nursing, medical office assisting, dental assisting, etc.--in two-year colleges.

   3. X-ray Technology, inhalation therapy, professional nursing, practical nursing, etc.--in hospitals.

   4. Practical nursing, nurse aides, food service assistants, etc.--in high schools.

   5. Dental laboratory technicians, optician technicians, medical instrumentation technicians, etc.--in industrial and manufacturing firms.

   6. Medical laboratory assistants, dental assistants, medical office assistants, medical secretaries, etc.--in private trade and commercial schools.

E. Because of the nature of the service for which health service personnel are prepared, educational facilities frequently include the use of clinical facilities.

F. The need for increased personnel for the health services has created a demand for expanding present educational facilities.

G. Where is the necessary technical faculty to be found?

Health Technology Faculty--A Profile

A. Academic and professional degrees notwithstanding, members of the health service establishment are ill-prepared for the educational establishment.

   1. Doctorates in medicine, dentistry, bacteriology, etc. do not assume qualification for teaching.

2. Paradoxically, many of the speciality fields for which personnel are needed in greater numbers are not necessarily those which require academic degrees for practice.

3. Colleges planning programs for the above fields are faced with the dilemma of seeking technical instructors who, more than likely, have not earned any college degrees--or, for that matter, college credit. Yet, who is best qualified to teach x-ray or inhalation therapy?

B. The health service industry and the educational establishment have two alternatives:

1. Delay development of new health technology programs until a sufficient number of health service practitioners are prepared in sufficient quantity via traditional teacher-preparing programs (ex! Nursing).

2. Develop new kinds of teacher-preparation programs or markedly accelerate present ones to meet the growing needs. The tremendous pressure of need has forced us to elect the second alternative--develop new and accelerated programs. We do not, at this time, know if such programs will be brush-fire stop-gap measures, or if they will force the educational establishment to reappraise the present methods of preparing instructors.

   Note: It is not suggested that the preparation of educators--with a capital E--should be changed, but simply that it may be possible to prepare a classroom instructor for a technical course in a shorter span of time.

Designing a Program to Prepare Instructors for Health Technology Program

A. The question we have to ask is:

"What does a health service practitioner need beyond his own technical competency in order to adequately function as an instructor?"

B. The answers we have received are: The technically competent practitioner should:

1. Have motivation to teach.

2. Know how and what to teach.

3. Understand the function, purposes, and philosophy of the kind of institution in which he will be teaching, and how that institution operates.

4. Know about the community by which the institution is surrounded.

5. Have knowledge and skill in developing a curriculum for his technical speciality.

6. Know the modal socio-economic profile of students.

7. Understand the budgetary and financial resources of the institution.

8. Develop his technical curriculum through an interdisciplinary approach.

9. Understand his role and function as a faculty member.

10. Have knowledge and skill in developing testing and evaluative techniques and instruments.

11. Know how to use audio-visual aids intelligently.

These are but a few of the essential elements that form the basis of a teacher-preparation program in any field. These are particularly important for health service practitioners who suddenly move into the educational establishment--their academic and professional degrees, or lack of degrees, not withstanding.

C. Problems:

1. Escalating academic requirements for "college" faculty.

2. Academic "snobbery"--humanities faculty vs. less academically prepared technical faculty.

Summary

The exigency of need does not permit us the luxury of TIME with which to prepare technical faculty as we traditionally prepare our humanities faculty. Moreover, we are not completely convinced that TIME is necessarily the factor which governs the quality of instructors for the technical fields.

Yet, TIME did play its part in the development of the technical instructor--it took TIME to bring him up to the competency for which we now seek him. He has spent many years learning to become a doctor, nurse, engineer, business manager, etc. He has demonstrated his competency in his technical field. We are now asking him to share his "know-how" by teaching it to young students who aspire to his field of endeavor. Can we, and should we, penalize him because he has not earned the kind of academic respectability associated with the "hallowed halls of academe"?

General Education for the Technical Teacher

Joseph P. Arnold*

The 3 R's tend to define general education as most of us consider it to be, however, in this talk it is enlarged to include all courses and formal activities designed and offered or required for any purpose other than for direct improvement of competency as a technical teacher.

General education, as Dean Simon so aptly stressed a few minutes ago, is and perhaps should be difficult to consider as separate from the other inclusions of the technical teacher education program. It is not an isolated package of education in pill form which merely awaits distribution, a few to each student. We may have difficulty in integrating the teaching-learning activities of the general education courses with the more specialized occupational offerings, but we can provide exposure and experience in selections from the liberal studies in a manner which will strengthen rather than counteract competency and interest in the technical subjects. Sudden scheduling of a heavy load of highly academic content would certainly tend to discourage the technical teacher education student. Hence spreading such courses throughout the entire program is desirable.

The nature of and rationale for what we call general education have been debated for centuries. Education for leisure long was recognized by many as the only education. The arrival of the technician on the scene helped change this attitude. To become participating responsible members of society, prospective teachers of these future technicians need more than a mere sprinkling of courses aimed at developing interests and views beyond the actual needs in the classrooms and laboratories.

Early in this century, John Dewey made the point that increasing occupational specialization tended to divide people into smaller groups of progressively narrower and more completely different backgrounds, which were less likely (and less able) to communicate with one another.[1] Common shared beliefs which are basic to the perpetuation of our democratic way of life were lacking. Hence, the problem of communication is not the exclusive learning of language skills and symbols, but rather is the development of background to permit and contribute to understanding and commonality of purpose among all people. Communication thus becomes fundamentally related to responsible citizenship.

The many forms of written, oral, and graphic communication are of strategic importance to the technician and are even more vitally important to the technical teacher. The technician must communicate with persons in charge of his work and with production and craft workers below him, usually in relatively different frames of reference. The teacher must master the same dual requirement, and in addition must include students, parents, administrators, colleagues in other subject areas, and the public.

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[1] John Dewey, Democracy and Education, Macmillan Company, New York, N.Y., 1916.

I am claiming that improving communication, both in the attainment of skills and in building levels of understanding and meaning, is the underlying objective of general education. Integration of such courses as those in English, speech, and technical report writing with the technical and scientific content is probably a good way to make the student realize the true value of these courses. Specific courses in the various aspects of communication skills undoubtedly are necessary, but should lean heavily on problems and assignments which relate directly to the technical areas.

To prescribe most of the courses in the general studies is probably a mistake. Most technical teacher education students probably have had little opportunity (to date) to elect courses which would help develop interests and capabilities beyond those needed in teaching. As in any other teacher education program, some electives should be allowed.

Every new teacher faces his classes with a minimal preparation in some ways, and the baccalaureate graduate in technical teacher education is perhaps no exception. He is not yet able to teach all the courses and with the skill which his department head would desire. As a beginner he also faces more problems than does his counterpart in the academic areas. He normally needs a master's degree for continued employment, and he faces obsolesence in his technical speciality if he fails to give it periodic and close attention. To be admitted to and for success in a given graduate program, he will face competition with students of broader orientations than his own. The general education background which we provide in his baccalaureate program may become a major factor in his success or failure in a graduate program.

Some combination of preparation in the social and behavioral sciences can hardly be omitted from this prospective teacher's program. Sociology, economics, and political science, particularly if courses have special emphases, such as industrial sociology, business economics, and American government, are recommended. Several areas of psychology should also be considered.

There is very little time remaining to discuss how to decide specifically which courses should be included. Obviously, each of us would include quite different courses and emphases in general education. One approach which may be helpful in avoiding haphazard selections and which will partially systemize course decisions is to base all selections of the total program on a ranked set of educational values developed by the appropriate institution or department committee. This procedure potentially has the advantage of relating each course decision to technical teacher functions.

It is hoped that program inclusions in general education will do much more than occupy a few semesters hours in the program. I believe these activities can be at least as beneficial to the student as any others. If properly structured into the program and coordinated to the extent possible by the technical teacher education staff, the content should accomplish its several objectives.

General Education for the Technical Teacher

Ernest J. Simon*

In the development of our technical programs, we have to recognize certain factors about the changing nature of work today and in the future. Distribution and controls are increasingly becoming more cognitive than physical skills. The amount of paper work that is associated with all types of technical occupations is increasing. A minimum command of communication skill is required on the part of even the lowest employee. When you get to the technical level you need more communication skill.

It is becoming increasingly important that the technician have a general education, a willingness to continue learning and education, and a willingness to accept change and mobility. All technical education curricula should represent a balanced mix of both general and liberal education, theory and technical support courses, and specialized skill courses. Both technical educators and employers of technicians are recognizing that the level and quality of a technician curriculum is determined by the preparation of the technician in the so-called general studies.

The general studies should be taught primarily in separate courses by qualified instructors, familiar with the overall technology objective. There was a time when I felt that possibly the technical teacher could teach the English, mathematics and science and related subjects better. I'm convinced that if we believe in occupational competency for teachers, then we should recognize the fact that the mathematics, English or science teacher has more occupational competency in that field than we have.

There is no general education vs. technical education--we've had too much of that. It's just a difference in mix. They all contribute to occupational competency. If they don't, then we shouldn't be teaching them.

For the technical program to be effective there has to be an understanding among the instructors in all phases of the program. This will require a new approach to the education of all teachers in technical programs, whether teachers of English or technical subjects. Surely the general education teacher and the technical speciality teacher must be able to communicate with one another much more effectively than at present. Each must contribute to the total occupational competency of the student. If this education is to be most fruitful, the technical teacher must have a broad educaton in mathematics to enable him to apply the principles in mathematical applications in his technical courses. Likewise the technical teacher must be well founded in the principles of physical science.

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All technical teachers, however, must possess more than technical knowledge. They must be able to effectively communicate with the students and others. They must be able to communicate their ideas concisely. Technical report writing and English composition and speech are extremely important to the education of technical teachers. The technical teacher must also be a professional student of the technological aspects of his culture. He must have an understanding and competency in the social and behavioral sciences with particular emphasis on the study of industrial and economic history and geography, industrial sociology, industrial education psychology, and an understanding of labor and industrial relations and political science.

Let's examine a situation as it relates to the development of the communication skill. Most of our English teachers, in colleges particularly, have majored in English because of their interest in literature rather than the use of the communication skills so necessary in verbal and written expression. Too often these courses have merely become hurdles for the student to overcome; a mere exercise to be promptly discarded. How many of our technical education teachers in their college programs have looked on English courses as mere hurdles?

To bring about a more meaningful relationship between English and technical subjects, and to raise the students' proficiency in the spoken and written word, we are trying an experiment. To get our technical teachers to recognize the need of our students, we've set aside a room close to the library and filled it with an English teacher eight hours a day, five days a week. This facility was made available to all students in the institute whether enrolled in English or not for professional help in the preparation of written assignments required in the various technical and related subjects, including general subjects. Thus a student majoring in commercial art or aviation technology who has a problem solving assignment has the opportunity to seek help in the organization and preparation of the paper. He's through with English up to that time. English had been a hurdle to overcome. What we're trying to get them to see is that it has become part of his packet of competency. The system has resulted in a much higher level of competency, appreciation and acceptance of English as part of the technical competence.

Second year students are provided with the opportunity of presenting two papers on any subject per quarter and at the end of three quarters they will get three hours of extra English credit, an elective credit, without attending a class. The future preparation of technical teachers must place emphasis on this type of education.

Instructors in such general areas as science, economics, etc. are working closely with the technical teacher to bring their various disciplines into sharper focus to the needs of the interested group. This close cooperation between all disciplines is effective in the placement of most of the graduates. Employers do look for excellence in the technical competency of the employees. They're particularly pleased to find that the graduates have the ability to express themselves and have a basic understanding of psychology, human behavior, and motivation to grow on a job.

For technical educators we need the same thing. We can't have them all go through a major in mathematics, science, and all the prerequisites. There isn't enough time. Our technical educators have to have all these competencies if we expect our students to have it. They have to have greater competencies than the minimum required of a student if we're going to meet the ever changing need. Right now you are dealing with the general education requirements for technical teachers, but those general education courses taught as they are now taught by people who are not oriented to this type of communication skill also have to undergo a few changes.

We also find that we have to train a new kind of general education teacher in the junior colleges and the technical institutes. There are two facets. The English teacher will not come from the technical institute, of course. We'll have to use the English teacher that we want in the curriculum. We don't want them to have the psychology of adolescence or child psychology. We want them to have educational psychology geared to this particular level and these problems. We are interested in a general course in psychology, but we would like to have the psychologist emphasize the everyday relationship--the importance of it in everyday work with people.

Compartmentalization has begun to break down every day. We have a program with about 160 majors in electronics data processing and computer programming. We have just installed an IBM 360 system. Our students in accounting should know a little about computers and data processing. We find the people in the electronics field should know something about data processing. We know that in a manufacturing process they should know something about numerical control and also about the use of the computer. Where does it end? We need to work closely with different organizations in industry through frequent seminars and work shops such as these.

General education requirements for technical teachers also demand a constant review and evaluation. We say in our technical education that to be effective we continually have to see to it that people go back. We were talking about sabbaticals back in industry, what about the English teacher, the psychology teacher? If we're going to use him effectively in our program, they must continually go back and gear more and more to the things that in the past had not been necessary, but today are becoming more necessary. Thank you, that's it.

Three Views of Professional Preparation for the Technical Teacher

Richard C. Erickson*

There are at least three viewpoints that might be taken relative to the professional preparation of the technical teacher. The oldest and still fairly prevalent viewpoint would hold that competence in one's area of technical speciality, ipso facto, assures possession of all the skills necessary to teach that speciality to others.

A second, and perhaps more rational viewpoint, would hold that competence in one's technical speciality is certainly essential, but there are other competencies needed by the technical teacher that generally are not provided for in his technical preparation. Ideally, the teacher of technical subjects should probably be in possession of knowledges, skills, and understanding that would enable him to: understand the purpose and value of education in general, and technical education in particular--understand the structure of the educational system in the United States and the function of technical education within this structure--present a logical position relative to his "philosophy" of education--understand the basic psychological principles underlying the teaching-learning process--effectively measure and evaluate the consequences of his instruction--draw from a variety of teaching methods and design effective learning experiences--adjust his instruction to meet the various student needs, problems, abilities, personality traits, and environmental conditions--evaluate and use the findings of educational research to improve his instruction--remain cognizant of the current and professional issues in education.

Supporters of this second viewpoint would hold that technical teacher education curricula should include a segment of "professional" as well as technical coursework. They would recommend that the prospective teacher be enrolled in "Technical Education in America," "Principles of Teaching Technical Subjects," "Measurement and Evaluation in Technical Education," "Special Methods of Teaching Technical Subjects," and/or other "professional" courses.

The third viewpoint relative to professional preparation for the technical teacher would, like the second, see the importance of including a "professional segment" of coursework in technical teacher education curricula. However, holders of this viewpoint would, in addition, raise the following question with respect to the efficiency of this segment of coursework. How does the usual professional course compare with other courses in the curriculum in terms of value derived per unit of effort put forth?

Advocates of this third viewpoint would submit that the professional segments of our technical teacher education programs are very inefficient and that this inefficiency is due to (1) a failure to "bridge the gap" between technical and professional coursework, and (2) a failure to advantageously employ the technological developments in communication media.

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The end result of not bridging the gap or tying together the professional and technical segments of the program is teachers who will tend to teach not in the way that they were taught to teach but in the way that _they_ were taught. One approach to bridging the gap might be through professionalization of some of the technical coursework in the teacher education curriculum--teaching new and vital technical content via methodological approaches that the student would be expected to use as a teacher, while continually weaving in the rationale underlying each methodological approach as the course progresses. If "teaching as you were taught" has any validity, then the integration of technical and professional content would certainly help bridge the gap and place behavioral change in the professional segment of the program on a more efficient basis.

Application of the myriad of technological achievements in the area of instructional media to technical teacher education should also have a notable effect on this efficiency. The rather recent developments in video-tape equipment make video-taped micro-teaching, viewing and reviewing master teachers at work, video-tape assisted supervision of student teachers, and canned presentations for individual and/or group instruction very real possibilities for technical teacher education.

In addition, there are many new possibilities for some of the more traditional instructional media. For example, single concept films, slides, and tape recordings might be employed in individualized self-pacing or programmed sequences. The telephone can be used for tele-lectures and tele-seminars--either of which could be augmented with visual media. There are certainly other media developments and applications of developments that could increase the effectiveness of the professional segment of most technical teacher education curricula.

In conclusion, the essence of what has been said in this presentation about professional preparation for the technical teacher can be distilled into the following statements. Technical competence in an area of endeavor does not, in itself, insure teaching competence in that area. Teachers tend to teach in the manner that they themselves were taught. Teachers tend to employ the methodology that they feel secure in using and security can usually be derived from first-hand experience with a particular methodological approach. If left to his own initiative, it takes quite some time for the technical teacher to bridge the gap between the "professional" and "technical" coursework in his preparation when they are offered in isolation. To be a designer of efficient as well as effective educational experiences, the technical teacher must have an understanding of the variables that affect the adult learner and an understanding of all the communication media that are potentially available as instructional media as well. Finally, the effectiveness of many of the traditional aspects of teacher preparation, i.e. class observation, student teaching, practice demonstrations, etc. could certainly be enhanced through advantageous use of recent technological advances in communications media.

The Intern Teaching Program for College Graduates

Russell A. Hill*

Our interest is in a specific kind of population and I hope there is some kind of generalization here. I direct an intern teaching program and am interested in recruiting students with a bachelor's degree and who have had no teaching experience.

This is the part of the group I'm after in the internship teaching program. I am after men, which is unusual; I have a three to one ratio of men in my program and in secondary and junior high education. I've been successful in being able to recruit this group. People who are twenty-five to thirty who have worked someplace else and know what work looks like. We post 20,000 of these announcements every year. We spend about $35 - $40 to get one person into the program. We visit eighty colleges, we keep in contact with the personnel offices of various state offices and so on, making them aware of this program. We work with these people to find jobs, we request that they go into the school district and make applications, go out on the market. We spend money inviting cooperating schools in to work with us during the year because we are working in partnership with them; both the schools and the internship program staff choose on this kind of thing. This is one of the major factors in the internship teaching program, cooperation with schools; they have to want to help you.

Well let's take a look at the curriculum, first of all in the curriculum pattern, part of the pedagogy, learning theory, method, and a little about teaching; then methods, student teaching. I think you're aware of what kids say. They'll hit the student teaching hard. If I could tell you the principles of curricular of organization in internship teaching program it is that. For example: you're an intern; you come to us in the summer; you are going to have a job in the Fall. The first thing said to you is what are you going to do the first day? We give them a chance to talk about it. We begin by the third day in a teaching situation with a teacher in a Center.

Teacher education programs usually start by taking ED 1, maybe as a sophomore or a junior. They move from the general, the broad view down to specific application, the methods. The methods is often the last step before the student teaching. We invert the whole thing. We start, as I said, on the first day and it only takes until the third day because that's how long it takes us to get the thing organized. Two years later they have a survey course: philosophy and sociology of education. The thing is that you have a job that you are going to do. We organize to come out to that job and relate it, and I try to find a faculty who aren't going to talk, but they're going to let these students bring in problem issues.

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Let me briefly draw up the summer program for you. The intern comes in on the first day for orientation. Then in the afternoon we say to 120 people, we want you to talk about teaching. We want to try to define it. Then we break up into small groups which become the backbone of the operation. We begin to build a discussion feeling. Interns sit down and discuss what is a good teacher. They try to list these characteristics and come back to the large group which has a recorder. Then a real live teacher begins to organize the characteristics of a good teacher. She puts it down in behavioral terms. This is a key concept in our program. Place, for example, is a simple one. Another is criticism. There is a system that has ten categories of verbal behavior in the classroom. I could spend three or four hours with you training you in these categories. We watch a teacher and one of these TV tapes and we come up with the same mathematical weight for the teacher. This is a key concept. We begin right away to teach them to observe teacher behavior.

One of the things that they are able to find out about teacher behavior is that one type of behavior that teachers use seems to be the most effective and that is using students' ideas. Take their ideas and build upon them. You get an answer from somebody, which might be incorrect, but you find some truth to it and you can use it as a basis to proceed. This is taking students' ideas, using them, generating them, weaving them in. They are trying to vary their questioning behavior. They are to try to get off the cognitive memory scale and into open-ended questions and convergent questions, and evaluate the questions rather than what all teachers do, cognitive memory.

We put them in a micro-teaching situation. Right now back at Temple, out of nine student teaching centers where we have our groups broken down, we have eight television cameras running for two and a half hours in the morning, and they come in and practice, teach, reteach, and that is the skill for the week. They teach, reteach in the morning, and go back to their student teaching situations. Now in the Fall they move in to spend full time on the job, and we have an experienced supervisor who is given six or seven first year interns. Supervisors are to see these interns once a week for two years. They are to come to know them and they are to work with them in the class. We are bringing supervision on a different scale to the interns. This is the backbone, supervision out in the field. Listening to the kids, working with them, and when they have an input or they have a methods or educational psychology course or a reading lesson, you've got a supervisor there working with them trying to put this into action. We charge for this very expensive supervision and it is accepted because these interns are making money. They're paid $6000 plus a year, so we charge them $1000 above and beyond tuition for supervision. Interns won't put up with a professor who tries to give them methods as usually given to undergraduates. These interns have experience; they've been out on the job.

The Ford Project for the Preparation of Technical Teachers

Charles A. Hill*

Ninety percent of the students enrolled in the Junior College District of St. Louis and St. Louis County have the baccalaureate degree as their educational goal. When it comes time to register, about seventy-five percent of them have signed up for the college transfer program. In the junior college, enrollees can take two years of college transfer program for application to a college or university program.

Aside from the college transfer program in the junior colleges, we have a number of other programs. Technical education programs offer preparation for occupations on the semi-professional level. We also have developmental programs in repair work before students go on into these technical programs. The community service program is available where people already employed can upgrade their skills, or maybe prepare to move into another occupation if their occupation has changed due to advances in technology.

There is a tendency for people enrolled in the junior college to look down on the occupational programs, such as data processing and engineering technician, a situation that exists in other schools. However, in industry, business and the professions, there is an entirely different view. The needs for the trained semi-professional individuals have been well documented. Our technological society requires people who have a more sophisticated education in order to function in their roles in business or industry.

Recently, the Ford Foundation awarded The Junior College District of St. Louis County, $500,000 to develop a program to increase the supply of teachers for post-high school or occupational programs, because with the growth of junior colleges the need for such teachers has become critical. The question is, where do we find them? This is a joint project of the St. Louis College District and Southern Illinois University. We just completed our pilot run of nine interns going through this program. In the next few years, we anticipate between thirty and forty annually. In our first group of interns we had one mechanical engineer, an electrical engineer, two physics majors, an English major, biology, and data processing. The objective of this program is to increase the supply of teachers for students in two-year occupational programs. In programs relating to agriculture we presently have one program in horticulture. Others are in business related occupations, accounting, data processing, engineering and industry, in health related fields, and public service.

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*Dr. Hill is Director, the Ford Project for the Preparation of Teachers.

As far as the program is concerned, there are really two phases to it. There's a master's degree program, and there's another that we call a pre-service program. The master's degree program provides the opportunity for an outstanding person to complete the requirements for a master's degree. Our pre-service program is really a transitional program for a person who is confident in his discipline and who has the academic preparation which is usually a master's degree for junior college teaching, plus work experience; because we feel that work experience is all important. If a person is going to be teaching an engineering technician and has never worked in industry, and has no idea what an engineering technician does, it's a little difficult to see how he's going to turn out a quality product.

As far as the master's degree program, this would involve the student taking his graduate work down at Southern Illinois University, and then topping that off with an internship within the junior college district. Within the program there are three types of master's degrees; the first is a one year master's in a related subject which might be English, mathematics, or any one of these so-called academic fields: any academic subject that ties in with the occupational program. Certainly the technical teacher is going to have to have a good background in mathematics. We'd like for the mathematics teacher to have a little feeling for the needs of the occupational program. English is probably the common denominator of all occupational programs because to be effective in business or industry, one has to be a good communicator.

The one-year technical subjects program is probably just as you expect. We take a person, for instance, who's interested and usually experienced in data processing. He goes down to Southern Illinois University and gets his master's degree, and then top that off with the internship. The three-year program enables the person who has completed the associate degree in an occupational area who has the potential for becoming a good teacher to complete the bachelor's degree and then go on into the technical subject master's degree program. In the pre-service program, I inserted the word transitional to clarify it a bit. Thinking of a fellow who worked for a large airline in St. Louis who decided that he wanted to be a teacher, this internship experience provided him with the means of making the transition into the teaching field. Teaching experience is not a necessary requirement to go into this program. As far as the selection criteria for pre-service interns, number one is competence in a discipline. When I start looking at the others, they are all important, because we want teachers who are not only competent in their discipline, but we want teachers who are interested in teaching. Ordinarily, in a junior college, a master's degree is considered a minimal education requirement, so we go along with that. Then we'd like professional experience in the discipline. If we have a nursing instructor come in we want her to have previous experience working in a hospital.

I mentioned something about the supervisor of the interns, each intern is provided with a supervisor. The supervisor is the so-called master teacher in the intern's discipline. This master teacher is given released time to work with the intern. His functions are as follows: to counsel with the intern regarding the teaching assignments, to help the intern establish the context needed during the internship core, to evaluate the intern's performance and potential, etc. The master teacher is responsible for the courses the intern teaches, for appraisal of students and making sure that the course content is covered. The responsibility for the individual class is the interns. The internship is one semester in length, full time. Interns receive stipends based upon the junior college district salary schedule. For a pre-service intern, his salary would be the same as if he were a full time teacher.

We'd like to have the intern learn something about effective teaching techniques. One way to do this is by observing other master teachers in operation. For example, a mechanical engineer might go out into the remedial reading lab, not that he's interested in teaching remedial reading, but it may be that the remedial reading teacher may have some good techniques for getting at kids who may be at the back of the room who are having a learning problem. We want these teachers not only to be interested in their discipline, but to be interested in students.

Public relations is very important. Going out to the high schools, working with the high school counselors to inform them as to the objectives of this type of program. Nobody wants to go into something that's terminal. We all want to have the next higher notch that we can shoot for.

The people who go through this program are not obligated to accept employment in the junior college district after the program. This is not a proprietary program by the junior college district for the people who participate. A person who goes through this program is a free agent after he completes the internship, because, getting back to our objective, it is to increase the supply of teachers for these career programs. However, if a person does want to teach in the junior college district and he has a sponsorship, this is being done.

A Review of Research in Vocational-Technical Teacher Education

Jerome Moss, Jr.*

Introduction

Every major division of education should periodically assess and synthesize the knowledge that has been accumulated through relevant research and development activities so as to make that knowledge more accessible and useful to practitioners and researchers. Such a review in vocational-technical teacher education seems long overdue. It is difficult, however, to satisfy the needs of both practititioners and researchers in a single review. Practitioners are primarily concerned about the application of new knowledge to operational situations. On the other hand, some researchers desire a comprehensive, annotated list of projects that will facilitate their own reviews of the literature, while other researchers want an organization and interpretation of completed projects that will open new vistas for further investigations. This review is directed principally to the latter group. Three steps were therefore taken.

First, a classification model was developed which provides an exhaustive series of relatively mutually exclusive categories in the realm of vocational-technical teacher education. The model provides a means for classifying studies that have been done, for showing the interrelationships among them, for uncovering gaps in our knowledge, and thus for planning further integrated programs of research.

Second, although it cannot be claimed comprehensive, a review of research was conducted. Since the 1962 issue of the *Review of Educational Research* on "Vocational, Technical, and Practical Arts Education" listed about ten studies in vocational-technical teacher education, 1962 seemed a good date with a fairly clean slate, at which to start the review. It soon became obvious, however, that restricting the review to materials dealing directly with teachers of vocational-technical programs would not result in a representative report of presently available, relevant knowledge. Consequently, the review encompasses some materials from the general field of teacher education. Finally, with respect to the limitations of the review, research, developmental, and pilot training projects were considered appropriate to report, but articles, speeches, and conference discussions which were not obviously based on some systematic, formal attempt to add to our knowledge in the field were generally excluded.

Third, following the review of literature and the organization of selected studies according to the classification system, an attempt was made to suggest some of the major questions for which research is needed in each of the categories of the model.

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A Classification Model

Figure 1 depicts the model utilized for classifying research in vocational-technical teacher education. The "Job Requirements" category contains studies which set the goals of the teacher education effort. The first subcategory of "role" presents attempts to provide current and predicted descriptions of the teacher's responsibilities and behaviors from psychological, sociological and educational perspectives. Role then determines the kind and amount of "competencies" required by teachers, shown as the second subcategory of studies. The nature of his role or roles, along with many other factors, also influences the third subcategory of investigations dealing with the current and predicted "numbers" of teachers needed.

The "Input" category answers questions about the amount and nature of the human resources available to teacher education programs. The subcategory of "sources" deals with the relative potential of various groups for providing appropriate numbers and kinds of prospective teachers, while "existing competencies" is concerned with studies which estimate the expected relevant capabilities of those source groups.

The differences between sets of competencies to be required by highly qualified teachers and those typically possessed by the several source or input groups dictate the various kinds of teacher education "Programs" that might be developed to effectively utilize available human resources. The familiar subcategories of "pre-service" and "in-service' programs are convenient to describe the stage in which programs are to be provided for input groups. Making a distinction between "degree" and non-degree" programs may have some practical value. Further, since each teacher education program must be concerned with content, method, organization and administration, and because specialized studies have been and should continue to be conducted in these areas, separate subcategories are provided for them.

"Guidance and Selection" studies, the fourth major category, logically follows the identification of prerequisite characteristics assumed by programs, and those attributes implied by and deemed important to success in programs after admission and following graduation.

"Recruitment" focuses on attempts to identify cogent incentives for each potential source of teachers, and to develop efficient means for communicating with prospects at propitious times.

The latest category, "Evaluation", includes attempts to estimate the effectiveness of the total system or separate parts of it. "Intrinsic" refers to studies which evaluate process; the criteria used are the programmatic variable themselves, such as facilities and content. "Pay-

Fig. 1

A MODEL FOR CLASSIFYING R & D IN VOCATIONAL-TECHNICAL TEACHER EDUCATION

	JOB REQUIREMENTS			INPUT		PROGRAM												GUIDANCE & SELECTION	RECRUITMENT	EVALUATION			
						Pre-Service						In-Service								Intrinsic		Pay-off	
						Degree			Non-degree			Degree			Non-degree								
	Roles	Competencies	Numbers	Sources	Existing Competencies	Content	Method	Org. & Admin.	Content	Method	Org. & Admin.	Content	Method	Org. & Admin.	Content	Method	Org. & Admin.			Formative	Summative	Formative	Summative
Research																							
Development																							
Pilot Demonstration																							
Dissemination																							

Off" evaluation, on the other hand, investigates the effects or products of the process (program) on students, on community, etc. using operationally defined criteria. Within each of these subcategories, the primary purpose of the evaluation may be "formative", to assist in developing and improving the program, or it may be "summative", to make a final estimate of program effectiveness.[1] No attempt was made in this review to utilize the categories of research, development, etc. However, 89 studies were reviewed and classified on the basis of Job Requirements, Input, Program, and other categories reading across Figure 1.

Summary

Considering the period of time covered by the review, researchers have not devoted a great deal of concentrated effort to vocational-technical teacher education problems. More importantly, with some exceptions of course, little has been done which materially contributes to the development of a science of teacher education. We need a system of verified principles which will permit us to understand and control the teacher education process. At present we are still operating programs on the basis of tradition, "convention" wisdom, and personal experience. This does not imply that current teacher education practices are necessarily bad or good, but that we just don't know, and that we cannot be confident about suggested means for improving practices. A somewhat understandable caution in making changes based on current knowledge is reflected in one study (Allen, 1966a) which asked fifty "leaders" from thirty-eight states to indicate the extent of innovations in their teacher education programs since 1961; "slight to moderate" change was the mode. The fact that the same study showed widely differing requirements indicates the importance of tradition and personal experience in determining program.

Most, if not all, of the categories utilized in this review do not represent problem areas unique to vocational-technical teacher education either in this country, to teacher education in general, or to education as a whole. Reports from European countries (International Vocational Training Information and Research Centre, 1964) reveal that they have concerns very similar to ours. Certainly, speculation about the desirable roles of future teachers and their behavioral patterns, the identification of relevant competencies, questions of supply and demand, problems of choosing and organizing content for programs, assessing student characteristics which affect success and satisfaction, and evaluating programs involve many elements which are common to all teacher education and to most other educational programs. The categories should therefore be recognized as an interpretation of persistent educational problems as seen from one special perspective.

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[1] A further explanation of the concepts "intrinsic, pay-off, formative and summative" evaluation can be found in the chapter by Michael Scriven, "The Methodology of Evaluation", Perspectives of Curriculum Evaluation, AERA Monograph Series on Curriculum Evaluation, No. 1, 1967.

In all probability, the most critical research problems in vocational-technical teacher education are also those most common to other kinds of educational programs. That is, the need for improved research methodology and instrumentation appears essential to progress in resolving the substantive questions represented by the major problem areas (categories) in this review. The attainment of satisfactory answers to our practical vocational-technical teacher education questions is therefore viewed as being dependent upon long-term programmatic research efforts, facilitated by the adoption of some research paradigm.[2]

The University of Texas has recently established a Research and Development Center in Teacher Education. We should follow its progress closely so as to utilize relevant results, but we should also undertake additional systematic efforts of our own. The task before us is too important and too large to depend entirely upon the efforts of others, or upon sporadic uncoordinated activities on our part.

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[2] The chapter by N. Gage in Handbook for Research on Teaching, 1963, contains a discussion of models for research on teaching.

Trends in Engineering Education

William K. LeBold*

Engineering education really didn't get started in this country until the land grant act was passed in 1865. We did have military academies established for essentially the military kind of engineering; some staffs in the classical schools in science education, but engineering was largely developed as on-the-job type of training much like the craftsman today.

Just prior to World War I engineering education began a series of investigations which have continued on ten year cycles. The first of these reports was the Mann[1] report released just before World War I. It is an excellent report with a practical view that engineering education should be close to industry. The Mann report was responsible for the expansion of the cooperative program. Our large institutions are now making the cooperative program an integral part of their education. The Wickenden[2] report was another report completed just prior to the depression. They collected a tremendous amount of information. It was probably one of the most informational studies ever conducted in higher education. The Hammond[3] report was one of the first reports concerned with educational objectives; it had a tremendous impact on general education in engineering. Up until this time, engineering education had been largely technical. The Grinter[4] study came up with an entirely different kind of input. There was a concern about technical obsolescence, a feeling that too many engineers were taking pride in tradition; seldom taking advantage of their theoretical knowledge in chemistry, physics, mathematics, etc. They really made a strong plea for what was called the engineering sciences. The primary difference was the idea that engineering was concerned with applying their knowledge rather than the creation of their knowledge.

The current Goals of Engineering Education project was innaugurated in 1962 under the direction and chairmanship of Eric Walker, President of Pennsylvania State University. The project itself has two phases. The undergraduate phase is under the direction of Dr. George Hawkins, who is the Vice President of Academic Affairs here at Purdue, but who was the Dean of Engineering until July 1, 1967, of this year. The graduate phase is under the direction of Dean Joseph Pettit who is Dean of Engineering at Stanford University.

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[1] C. R. Mann, A Study of Engineering Education, Bulletin No. 11, The Carnegie Foundation for the Advancement of Teaching, 1918.

[2] W. E. Wickenden, Report of the Investigation of Engineering Education, 1923-1929, Pittsburgh, Society for the Promotion of Engineering Education, Vol. I, 1930, Vol. II, 1934.

[3] H. P. Hammond, "Aims and Scope of Engineering Curricula," Journal of Engineering Education, March 1940, 30, No. 7, 555-566.

[4] L. E. Grinter, "A Manual on Graduate Study in Engineering," Journal of Engineering Education, June 1945, 35, No. 10, 615-652.

What are some of the problems that engineering education faces? First of all, the tremendous diversity of engineering education presents a very serious problem when you begin to design curricula, because you find engineers in research, development, design, management, production, construction, etc. If we were to examine this diversity a little closer and look to the trends, one of the things that we noticed was the thought by many people that engineers were going into research and development in very large numbers and proportions. They are involved in many fields, industries, functions, and at various levels from the highest administrative posts to technicians, and the climate is continually changing for the individual and the profession.

Although the Preliminary Report[5] of the Goals study was the subject of much controversy, the Interim report was less so, and I suspect the Final report will be a guide-line, if not a landmark.

What are the implications of the "Goals Study"? (1) The need for not only more engineers but more supporting personnel. This means technicians, technologists, scientists, mathematicians, and computer scientists. This whole gammet of technical personnel is necessary in our emerging society. One of the things we recommended in our Interim report was that a comprehensive study of technician and technology education be conducted. (2) The need for more breadth in engineering education. If engineers are to assume the responsibilities for things that are having such a social impact on society, they will have to have a much broader education than in the past. (3) In the next decade that engineering education will move to make the master's degree the first professional degree. (4) The need for continuing education.

As engineering education moves into more graduate professional education, there is going to be a void here that must be filled by the technicians and the technologists. One of the reasons our engineers are in such demand today is not purely for the technical education but due to the fact that they have this broad base and they are able to assume substantial responsibilities in industry and government. For example, prior to 1950 most of the super-grades in the government were held by lawyers and business graduates. Today, most of the super-grade positions in the government are held by engineers and scientists.

Similar observation can be made if one examines the leadership in American industry; if this is going to continue to be the case, engineers and scientists are going to need greater support from technicians, technologists and related technical-scientific occupations.

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[5] E. A. Walker, Goals of Engineering Education, The Preliminary Report, American Society for Engineering Education, October 1965.

Industrial Interests and Activities in Technical Education

Charles R. Bowen*

The first thing I would like to talk about is a three part program. The most ambitious part is still to take place. This would probably double enrollments in technical institutes in the next five years. We have been working with the National Industrial Conference Board and the U. S. Commissioner of Education, Harold Howe, to see if we couldn't interest the National Advertising Council in a program to stimulate student, parent, and teacher interest in careers as a technician. We are convinced that one of the problems is lack of knowledge on the parts of parents, teachers, counselors and students of the tremendous career opportunities which exist in the technician field. As you know better than I, there is a gap between capacity and enrollment in the technical institutes in the nation. Total enrollment is 150-160 thousand in two-year post-secondary technical institutes. Capacity is 210-219 thousand with a great deal more planned under the federal program. So it's this desire on the part of industry as a consumer to see faculty and facility utilized closer to 100% that has prompted our desire to move in this direction.

The "Buy Defense Bonds" is an Advertising Council Program; "Smokey the Bear" also. In such cases, you get about five and ten million dollars worth of advertising.

I'll give you some idea how much advertising that is. I think American Motors does about $5 million to $10 million in advertising. That would be twice as much advertising as a company like IBM does in total. It is a tremendous amount of advertising if we get it. Now the presentation is yet to be made to the Advertising Council but Commissioner Howe and Grant Venn are very enthusiastic about this. Commissioner Howe and the head of the National Industrial Conference Board, a most distinguished industrial group, will make this presentation to the Ad Council. It will be a very simple, straight-forward campaign in television, billboards, newspapers, magazines; something similar to: "Have you considered a career as a technician? There are tremendous rewards...and the nation needs more technicians. Write to Box Opportunity, Grand Central Terminal, such and such." When they write away, they will receive a 12 page booklet which gives them details on how to get into a technical institute. It has to be rather general because they don't rifle these campaigns, they use a buckshot approach. One thing is the Advertising Council.

The second thing we have done is something a little more specific to our industry but I think it can serve as a model for other industries with technical institutes. This is something with which some of you may be familiar. It's an independent, non-profit, incorporated body called the Technical Education Consortium, Inc. The chairman is D. M. Fellows, care of Ward Technical Institute, University of Hartford, 315 Hudson Street, Hartford, Connecticut, and Doug can give you more of an educator's viewpoint than I. But, I'll tell you some of the background.

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We had, in the data processing industry, been faced with the kind of typical communications gap which develops between a rapidly growing industry and education. Data processing, as you probably know, is one of the two or three fastest growing industries in the country. We were having either to hire men with a two year AAS Degree in Heavy Mechanics and having to retrain them in electricity-electronics; or, conversely, we were hiring men from the electricity-electronics side trained in communications primarily and having to retrain on the mechanics side, small mechanics. Eighty-five percent of our maintenance and service is on the electro-mechanical elements: the in-put and out-put devices, such as printers and card readers which are laboring at absolutely maximum capacity. We wanted a combination of these two existing disciplines --electrical and mechanical with applications taught on business machines--all kinds of business machines whether cash registers, small adding machines or computers. We don't want the technical institutes to do our training for us. This is one thing I think a lot of people think about industry. It's the last thing we want because the moment you start doing our training for us, you're going to do it on somebody's equipment which is either not our equipment; or, if it's my equipment, it's not his; and very likely in either case it's going to be obsolete equipment. What we wanted was a program of education that would better prepare men for the type of training they'd get when they came to us. Our training ranges from 10 to 52 weeks for people we hire with an AS Degree. So a group of schools banded together; Ward Technical, New York City Community College, DeVry Technical, Southern Technical, Dunwoody and Oregon Technical to form a Consortium. There is one other member now, Spring Garden Technical Institute in Philadelphia. They are looking for other members. They have a student support program from IBM which can accomodate up to ten members. But, they are developing and testing mainly with federal support this new electro-mechanical curriculum which then will be published and disseminated probably in six or seven different versions to all technical institutes. Industry, not only Data Processing, but the Aero Space and Defense people are very enthusiastic about this electro-mechanical curriculum.

The needs of industry in general are so tremendous for this type of person and so far exceed what could possibly be produced in the next five years by technical institutes that the third part of our program (which also has an implication for you) is a high school, 10th, 11th, 12th grade technical education path, in electro-mechanics. It will neither be vocational training nor academic but a new track that we hope will draw primarily from general education. This also, is supported by federal funds. Ward Technical Institute's Doug Fellows is the contractor for the federal governement to design this new high school path which would feed the technical institutes in the electro-mechanical speciality. For those students who chose to go no further than the 12th grade, it would also feed direct into industry.

So, these are the three legs of our program: (1) the Advertising Council which will be in general terms, urging youth to investigate being a technician as a career opportunity; (2) the Consortium which is open to other members and is entirely independent, a non-profit organization whose board comprises solely representatives from the educational institutions who participate; and (3) the third area which has just begun of the 15 or 16 high schools that are developing and testing the high school curriculum in electro-mechanics for which Ward is the contractor.

Extra-Institutional Factors Related to the Employment of Vocational-Technical Teachers

Jesse J. Defore*

There are many factors which educational institutions must consider when they seek to employ instructional staff for vocational-technical programs. Certainly, some of these factors are related to the individual teacher: his appearance, his personality, his learning, his reputation. Criteria for employment and utilization of faculty members, as the criteria relate to the factors just named, are always entirely discretionary with the institution. On the other hand, an institution is not entirely free to set some important criteria for employment of its staff; the requirements or recommendations of external agencies or organizations often exert an influence on institutional decisions.

The various accrediting agencies comprise one set of extra-institutional bodies which influence staffing policies. The six Regional Accrediting Associations, for example, each have recommendations about faculty qualifications. Community colleges and other higher institutions are sensitive to such recommendations and tend to conform with them. This practice may have implications for staff selection. The Associations and their recommended guidelines for faculty qualifications are listed in Table 1.

Table 1: Criteria Recommended by the Regional Associations for Selection of Faculty Members of Community Colleges

New England Association	Supports the requirements listed by the various states.
Middle States Association	Recommends that colleges seeking accreditation should have a professional staff "...well qualified in health, personality, and character, and competent in various fields of educational and related services."
Southern Association	Suggest that faculty members should have as minimum qualifications the baccalaureate degree including at least 12 credits in the disciplinary area involved; teachers for vocational subjects should have in addition teaching experience"...as recognized by the state."

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North Central Association	Recommends that teachers have a baccalaureate or higher degree from an institution accredited by the North Central Association or equal and suggests the degree should include a minimum of 30 credit hours of general preparation and a minimum of 18 credit hours in the teaching field.
Northwest Association	Recommends a baccalaureate or higher degree; suggest 14 credit hours of professional education courses and 16 credit hours in the teaching field as minimum qualifications.
Western Association	Recommends a master's degree in the teaching field or equivalent.

Professional associations, primarily the National League for Nursing and the Engineers' Council for Professional Development, also exert an influence on educational institutions as they select and utilize staff. The National League for Nursing, for example, has been approved by the National Commission on Accreditation as the agency to evaluate and accredit certain curricula in the health-related fields; such accreditation being required in order that the institution receive revenues from Federal sources. NLN's recommendations, then, are usually carefully followed, and may often form criteria for staffing. Similarly, the Engineers' Council for Professional Development (ECPD) is the agency approved by NCA to accredit curricula in the engineering technology area. Like NLN, ECPD has guidelines for faculty selection; ECPD, therefore, exerts an appreciable influence on institutional practices in staffing.

In practice, both NLN and ECPD carry out their evaluative program concurrently with an accreditation visit from a team representing appropriate Regional Accreditating Association, unless the institution requesting evaluation requests a special visitation from either or both professional agencies. It is to be emphasized that both regional and professional accreditation are voluntary on the part of an institution. None of the agencies provide their services unles requested to do so. On the other hand, the guidelines set by these extra-institutional agencies are applied to the institution and some loss of institutional autonomy results; hopefully, the benefits derived from the accreditation process outnumber any possible detriments.

A second set of extra-institutional bodies influencing staffing policies are the State Departments of Vocational Education, or their counterparts. These agencies have a substantial effect on faculty selection and utilization in public institutions. The requirements for certification differ somewhat from state to state, but in all states there exist rather comprehensive and restrictive regulations governing the certification of vocational-technical teachers. Since the amount of salary or program reimbursement an institution receives is usually directly related to the number of teachers having valid vocational certificates, institutions tend to conform exactly with the relevant state regulations. While such regulations are almost always soundly rational in basis, they often limit drastically the freedom of institutions.

A third extra-institutional influence on faculty procurement and utilization comes from the Federal Government. While Federal regulations governing selection of faculty members for vocational-technical programs are indirectly applied to institutions (mainly through a "state plan for vocational education" administered by a State Department of Education), these regulations are nevertheless applied stringently and rigidly. The legislation setting up programs of Federal aid to vocational education were often highly directive insofar as guidelines for staffing are concerned. The major acts involved are the Smith-Hughes Act, the George-Barden Act, and the Vocational Education Act of 1963, but the Higher Education Facilities Act and the Higher Education Act also have implications for institutions seeking funds in support of vocational-technical programs.

A final factor influencing selection and utilization of vocational-technical teachers is the geographic distribution of centers of vocational-technical education. Area vocational schools, public and private technical institutes, governmental agencies, universities, and comprehensive community colleges are all competing for the limited supply of skilled and qualified manpower available for teaching posts. In certain states, occupational curricula are offered at a substantial number of centers; in others, no such schools exist. Nationally, approximately 50 community colleges per year are opening their doors, and most of these schools express a commitment to vocational-technical education. These new institutions are vigorously recruiting faculty personnel. Where there are high levels of staff recruitment activity, differential application of criteria for employment may sometimes be found; this is less likely where the level of activity in recruiting and selection is lower.

Institutions of higher education seek to be autonomous, but a number of extra-institutional factors influence their actions, particularly in the employment of vocational-technical teachers. Some of these factors were identified here. Regional Accrediting Associations, professional agencies, State Departments of Education, the Federal Government, and the coincidence of geographic location all work to limit institutional freedom in the faculty selection process. None of these external influences are necessarily detrimental; all, in fact, contribute importantly to the advancement of the goals of vocational-technical education; but all are significant factors to be evaluated as institutional decisions are made.

APPENDIX A

RATING SCALE FOR PRESENTATIONS

Summer Institute for The Improvement of Technical Teacher Education Programs
Department of Industrial Education, Purdue University, 1967

Note to Institute Participants: The following is a list of qualities that, when considered as a whole, constitute a descriptive picture of almost any type of presentation. Most presentations would not approach the ideal in all of these qualities; some, however, would approach this ideal to a greater or lesser extent than others. As a part of the evaluation of this institute you are asked to rate today's presentations on the qualities listed below.

Darken one of the spaces on the line at the point which most nearly describes this presentation relative to that particular quality. For example, under Presenters' Interest in Subject, if you think the presenters were not as enthusiastic about their topic as they should have been, but were more than mildly interested, darken the space marked 4. This rating is to be anonymous. Please do not sign your name on this form.

1.	Presenters' Interest in Subject	1	2	3	4	5	6	7	8	9	10
		Appeared to be very interested in subject				Seemed only mildly interested			Subject appeared irksome to them		
2.	Liberal and Progressive Attitude of Presenters	1	2	3	4	5	6	7	8	9	10
		Welcomed differences in viewpoint				Somewhat biased on some points, but usually tolerant			Entirely intolerant, allowed no contradiction		
3.	Manner of Subject Matter Presentation	1	2	3	4	5	6	7	8	9	10
		Clear, definite, and forceful				Somewhat mechanical and monotonous			Confusing, indefinite, and monotonous		
4.	Sense of Proportion and Humor of Presenters	1	2	3	4	5	6	7	8	9	10
		Proper balance; not overly serious or overly humorous				Fairly well balanced			No sense of proportion		
5.	Organization of Subject Matter for Presentation	1	2	3	4	5	6	7	8	9	10
		Clear pattern of organization evident				Fairly well organized			Lacked any semblance of organization		
6.	Self-reliance and Confidence of Presenters	1	2	3	4	5	6	7	8	9	10
		Always appeared poised and confident				Fairly self-confident; occasionally shaken			Extremely timid, rattled and uncertain		
7.	Personal Peculiarities of Presenters	1	2	3	4	5	6	7	8	9	10
		Wholly free from distracting mannerisms				Moderately free from objectionable mannerisms			Constantly exhibited distracting mannerisms		
8.	Stimulating Intellectual Curiosity	1	2	3	4	5	6	7	8	9	10
		Definitely raised level of interest in topic				Created mild interest in topic			Destroyed all interest in topic		
9.	Emphasis of Content in Presentation	1	2	3	4	5	6	7	8	9	10
		Important points were stressed				Fairly good balance between importance of topics and time spent on them			No sense of balance relative to importance and time		
10.	Contribution to the Objectives of the Institute	1	2	3	4	5	6	7	8	9	10
		Made a very significant contribution				Made a moderately significant contribution			Contributed absolutely nothing		

On the reverse side of this form briefly itemize the ideas discussed in today's program which you feel were most important to fulfilling the objectives of the institute.

APPENDIX B

TECHNICAL TEACHER BACKGROUND PREFERENCE

Name ______________________ Date ____________

My responses to this scale are most applicable to technical teacher education in the following area. (Check only one)

___Engineering-related
___Aviation
___Industrial
___Health-related
___Agricultural
___Office-related
___Other ______________ (specify)

Note to Institute Participants: The following categories are assumed to be inclusive of all formal preparation which may be feasible to include in a technical teacher education program. As a part of the evaluation of this institute, you are asked to rate each category in terms of its relative importance to technical teacher education. For example, if you feel that student teaching is an unimportant experience in the preparation of a technical teacher, circle one of the numbers at the lower end of the scale.

Curricula or Experience	Unimportant				Somewhat Important			Extremely Important		
Allied Technical	1	2	3	4	5	6	7	8	9	10
Behavioral Sciences	1	2	3	4	5	6	7	8	9	10
Business Administration	1	2	3	4	5	6	7	8	9	10
Humanities	1	2	3	4	5	6	7	8	9	10
Life Science	1	2	3	4	5	6	7	8	9	10
Mathematics	1	2	3	4	5	6	7	8	9	10
Physical Sciences	1	2	3	4	5	6	7	8	9	10
Professional Teacher Education	1	2	3	4	5	6	7	8	9	10
Related Occupational Experience	1	2	3	4	5	6	7	8	9	10
Student Teaching	1	2	3	4	5	6	7	8	9	10
Technical Speciality	1	2	3	4	5	6	7	8	9	10
Written and Oral Communication	1	2	3	4	5	6	7	8	9	10

APPENDIX C

INSTITUTE EVALUATION SCALE

Statements	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
In regard to this conference I feel that:					
1. The purposes of the institute were clear to me	5	4	3	2	1
2. The objectives of the institute were not realistic	5	4	3	2	1
3. Well defined purposes made it easy to work efficiently	5	4	3	2	1
4. The purposes of the institute were accepted by the participants	5	4	3	2	1
5. The objectives of the institute were not the same as my objectives	5	4	3	2	1
6. I didn't learn anything new which would help me in technical teacher education program development	5	4	3	2	1
7. The material presented was valuable to me	5	4	3	2	1
8. I could have learned as much about technical teacher education by reading	5	4	3	2	1
9. Possible solutions to my problems were considered	5	4	3	2	1
10. The information presented was too elementary	5	4	3	2	1
11. The speakers knew their subjects well	5	4	3	2	1
12. The time spent in work groups was worthwhile in terms of the objectives of the institute	5	4	3	2	1
13. I was stimulated to think objectively about the topics presented	5	4	3	2	1
14. New acquaintances were made which will help in future technical curriculum development	5	4	3	2	1

Statements	Strongly Agree	Agree	Undecided	Disagree	Strongly Agree
15. We worked well together as a total group	5	4	3	2	1
16. We did not relate theory to practice	5	4	3	2	1
17. The sessions followed a logical pattern	5	4	3	2	1
18. The institute schedule was too rigid	5	4	3	2	1
19. The work group discussions were excellent	5	4	3	2	1
20. There was very little time for informal conversation	5	4	3	2	1
21. Too much time was devoted to trivial matters	5	4	3	2	1
22. I felt a part of this group	5	4	3	2	1
23. The work group sessions were dominated by a few individuals	5	4	3	2	1
24. The institute met my expectations	5	4	3	2	1
25. I have no guide lines for future action	5	4	3	2	1
26. I did not have an opportunity to express my ideas	5	4	3	2	1
27. The information presented was too advanced	5	4	3	2	1
28. The content presented was not applicable to program development in technical teacher education	5	4	3	2	1
29. Institutes such as this will contribute little to curriculum development in technical teacher education	5	4	3	2	1
30. Institutes of this nature should be offered in future years	5	4	3	2	1

APPENDIX D

PURDUE UNIVERSITY
School of Technology
Lafayette, Indiana 47907

Department of
Industrial Education

Preliminary Announcement
March, 1967

Applications are now being received for enrollment in:

A Summer Institute for the Improvement
of Technical Teacher Education Programs,
to be held July 10 through July 21, 1967

The need for quality technical teachers in the United States has passed from the obvious to a condition of near crises. While junior colleges, technical institutes, universities, area vocational schools, and other institutions have been developing a wide variety of programs designed to prepare young people for jobs as technicians and positions similar in level, there has been relatively little organized, parallel effort to develop programs for the preparation of quality technical teachers. Current typical sources of such teachers--business and industry, engineering, and the military--obviously are inadequate to satisfy the increasing demand for qualified technical teachers. Hence, immediate attention to the improvement and development of quality teacher education programs for the many technical areas is needed.

Objectives

The Institute, supported by U. S. Office of Education under the provisions of P. L. 88-210, will deal with the problems, issues, and current practices in technical teacher education. Presentations and discussion will focus upon the development of quality baccalaureate programs in the preparation of technical teachers for the rapidly expanding offerings of junior colleges, technical institutes and other institutions. Program presenters and participants will be concerned with:

1. delineation and review of the expected capabilities and background of technical teachers in selected areas of specialization.

2. cooperative development and critique of sample technical teacher preparation offerings.

3. discussion and review of recent and current relevant research for use in technical teacher education program design.

4. development and refinement of a framework for technical teacher education with emphasis on the baccalaureate programs.

5. examination of existing bachelors', masters', doctoral, and in-service technical teacher education programs.

Staff

The Institute is planned and operated by the Department of Industrial Education staff as follows;

Director	- Dr. Joseph P. Arnold
Assistant Directors	- Dr. Alan R. Suess Dr. Richard C. Erickson
Graduate Assistant	- Mr. James Hennig

Purdue staff who tentatively will be making presentations are:

Dr. George W. McNelly, Dean, School of Technology
Dr. William K. LeBold, School of Engineering
Professor J. P. Lisack, Director, Office of Manpower Studies
Professor James R. Maris, Head, Department of Aviation Technology
Professor Gilbert Rainey, Head, Department of Electrical Engineering Technology
Professor Walter E. Thomas, Head, Department of Manufacturing Technology

Several staff members from other universities and specialists from the U. S. Office of Education will be utilized as discussion leaders and to address participants. Tentative agreement for involvement has been secured from:

Dr. Lynn A. Emerson
Professor Emeritus
Cornell University

Dr. Jesse Defore
Dean of Occupational Curricula
Central Michigan College

Dr. Jerome Moss, Jr.
Professor and Director of
Minnesota Research Coordinating Unit
University of Minnesota

Mr. Robert Knoebel
Program Specialist in
Technical Education
U. S. Office of Education

Miss Muriel Ratner, Director
Health Technologies Teacher Preparation
City University of New York
New York, New York

The cooperation of a number of other well qualified persons has yet to be solicited.

Participants

Applicants representing interests and institutions directly involved with the design and operation of technical teacher education programs will be given preference. The selection of forty persons from among applicants will be based upon:

1. Overall potentiality for involvement in the initiation and/or operation of technical teacher education programs.

2. Broad inclusion of technical areas of interest.

3. Balanced representation between staff of smaller and larger institutions.

APPENDIX E

Application Form

Return to: Dr. Joseph P. Arnold
Bldg. C, S. Campus Courts
Purdue University
Lafayette, Indiana

A SUMMER INSTITUTE FOR THE IMPROVEMENT OF TECHNICAL TEACHER EDUCATION

Department of Industrial Education, Purdue University
July 10 through July 21, 1967

Name:
(last) (first) (initial) (telephone) (area code)

Mailing Address:
(street) (city) (state) (zip)

Please supply the following information using an attached sheet if necessary, with points numbered as follows:

1. Educational Background

	(institution)	(year)	(major area)
Baccalaureate-			
Master's -			
Doctorate -			
Other -			

2. Professional Experience

Current Position -
(title) (years held)

Institution -
(name) (location)

Major Responsibilities -

2. Previous Positions -

(employer)	(location)	(title or function)

3. Professional Activities in Teacher Education (include dates)

Supervisory and/or Teaching Activities - ______________________________

____

____

____

Publications - ____

____

Pertinent Professional Organizations and Positions Held - ______________

____

____

____

Research Completed (cite agency if funded) - _________________________

____

Research in Progress-____

____

Other - ____

____

4. Other Professional Activities (summarize; include dates) ______________

____

5. Occupational Background (Summarize major areas of work experience outside education)

6. Describe current or anticipated activities of your institution in technical teacher education

7. What is your purpose in desiring to participate in the institute?

8. List two persons with professional interest in technical teacher education who are willing to offer verbal support for your participation

(name) (position) (address) (telephone)

9. Do you intend to enroll for university credit? _____